

ENGINEERING DESIGN FILE

PROJECT NO. 22901

SECONDARY CONTAINMENT AND SUPPORT SKID DESIGN FOR V-TANK CONSOLIDATION TANKS



Form 412.14
10/9/2003
Rev. 05

EDF No.: 5017 EDF Rev. No.: 1 Project File No.: 22901

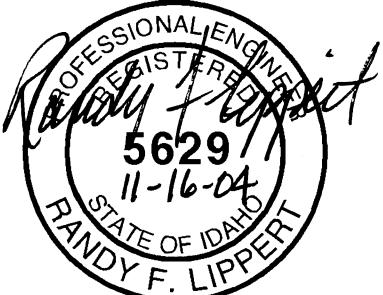
1. Title: Secondary Containment and Support Skid Design for V-Tank Consolidation Tanks				
2. Index Codes: Building/Type <u>N/A</u> SSC ID <u>N/A</u> Site Area <u>034 (TAN)</u>				
3. NPH Performance Category: <u>PC-0</u> or <input type="checkbox"/> <u>N/A</u>				
4. EDF Safety Category: <u>CG</u> or <input type="checkbox"/> <u>N/A</u> SCC Safety Category: <u>CG</u> or <input type="checkbox"/> <u>N/A</u>				
5. Summary: This EDF documents the design calculations for the secondary containment and supporting skid for new consolidation tanks. Contents of the TAN V-tanks will be removed and placed in the new consolidation tanks for subsequent treatment. The proposed location of the consolidation tanks is the area north of building TAN-666. This area will be regraded and the support skid placed on gravel fill. The calculations include the design of a secondary containment pan, tank shield plates with supporting frame, and tank support skid. Also included in this EDF is an analysis of a V-Tank Mockup platform designed by B. D. Raivo.				
Due to an increase in size of the tank shield plates to provide additional shielding, a redesign of the shield plates and their supporting frame has been provided in this revision of the EDF. Attachment 2 has been replaced with the modified design, and since the plates and frame weight has increased, minor changes were made to Attachments 3 and 4.				
6. Review (R) and Approval (A) and Acceptance (Ac) Signatures: (See instructions for definitions of terms and significance of signatures.)				
	R/A	Typed Name/Organization	Signature	Date
Performer/Author	N/A	R. F. Lippert, P.E. / 3K16		11-16-04
Technical Checker	R	D. L. Stephens, P.E. / 3K16		11-16-04
Approver	A	V. J. Balls, P.E. / 3K16		11-17-04
Design Project Engineer	Ac	M. E. Bodily / 3K16		11-16-04
Program Project Engineer	Ac	G. E. McDannel / 3CH0		11-16-04
Doc. Control		<u>B. METCALF</u>		11-17-04
7. Distribution: (Name and Mail Stop)		R. F. Lippert MS 3650, G. E. McDannel MS 9206		
8. Does document contain sensitive unclassified information? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, what category:				
9. Can document be externally distributed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
10. Uniform File Code: <u>8201</u> Disposition Authority: <u>A17-31-a-1</u> Record Retention Period: Until dismantlement or disposal of facility, equipment, system or process				
11. For QA Records Classification Only: <input type="checkbox"/> Lifetime <input type="checkbox"/> Nonpermanent <input type="checkbox"/> Permanent Item and activity to which the QA Record apply:				
12. NRC related? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				

431.02
01/30/2003
Rev. 11

ENGINEERING DESIGN FILE

EDF-5017
Revision 1
Page 2 of 148

EDF No.: 5017 EDF Rev. No.: 1 Project File No.: 22901

1. Title: Secondary Containment and Support Skid Design for V-Tank Consolidation Tanks
2. Index Codes: Building/Type <u>N/A</u> SSC ID <u>N/A</u> Site Area <u>034 (TAN)</u>
13. Registered Professional Engineer's Stamp (if required)


CONTENTS

1. PURPOSE.....	4
2. SCOPE.....	4
3. SAFETY CATEGORY.....	4
4. NATURAL PHENOMENA	4
5. SYSTEM DESCRIPTION.....	4
6. DESIGN AND ANALYSIS	5
7. LOADS	5
8. ASSUMPTIONS.....	5
9. ACCEPTANCE CRITERIA.....	7
10. RESULTS	7
11. REFERENCES	7
Attachment 1 Secondary Containment Pan Design.....	9
Attachment 2, Tank Shield and Support Frame Design	10
Attachment 3, Tank Support Frame Design.....	11
Attachment 4, Ground Support Evaluation	12
Attachment 5, Tank Seismic Stability	13
Attachment 6, V-Tank Mockup Platform Analysis.....	112
Attachment 7, Design Drawings	114

FIGURES

1. Consolidation tank layout.....	6
-----------------------------------	---

Secondary Containment and Support Skid Design for V-Tank Consolidation Tanks

1. PURPOSE

The structural analysis and design contained in this Engineering Design File (EDF) are provided in support of the removal of contents from Technical Support Facility (TSF)-09 Tanks V-1, V-2 and V-3, and TSF-18 Tank V-9. This is the initial phase of the Environmental Remediation of the TAN V-Tanks supporting the Waste Area Group (WAG)-I Operable Unit (OU) 1-10 remedial action activity. Removal of the V-Tank waste contents is to be accomplished by extracting the liquid and sludge and placing it into new receiving tanks, called "consolidation tanks," to be located in an area north of Building TAN-666.

2. SCOPE

Components of the consolidation tank system include a secondary containment vessel, radiation shielding, and associated support structures. The designs of these components are provided in this EDF.

3. SAFETY CATEGORY

The Safety Category for the V-Tank system is Consumer Grade as defined in TFR-278 (see Reference 1).

4. NATURAL PHENOMENA

The natural phenomena hazards (NPH) classification for the V-Tanks remedial activity is Performance Category 0 (PC-0) as defined in TFR-278. For PC-0, no special NPH considerations are required per DOE-STD-1020 (Reference 14).

5. SYSTEM DESCRIPTION

It is proposed to empty the liquid and sludge waste contained in the V-Tanks into three new consolidation tanks that will be located west of the V-tank site in a nearby area north of Building TAN-666. The new tanks are to be identical, each with a capacity of 8,000 gal. The tanks will be cylindrical and supported vertically on legs. Secondary containment must be provided in case of a tank leak. The containment must have a minimum capacity equal to 100% of one of the tanks (8,000 gal) to be in accordance with 40 CFR 264.193 (see Reference 8) as required by TFR-278. A pan constructed from steel plate is designed to provide this containment. To hold 8,000 gal, the pan floor is approximately 21 ft square with a wall height of 3 ft. All three consolidation tanks will sit inside the pan.

Due to the anticipated radiation fields generated from the V-tank waste, shield barriers are required to lower the radiation doses and limit streaming near the tanks to acceptable levels. Valves and pumps associated with the new consolidation tank system will be located in the containment pan and require access by an operator; therefore, shielding is required inside the containment pan adjacent to the walls of the tanks. Thick steel plate is to be used for this shielding and will be supported by a structural steel frame. The plates will extend to a height of approximately 14.5 ft to protect the pump area and immediate surrounding areas. Shielding requirements were based on the calculations of EDF-4604 (see Reference 7).

The area north of Building TAN-666 is currently vacant. The area will need to be cleared of the existing vegetation and have gravel fill in order to support the consolidation tanks. To ensure stable support for the weight of the tanks, containment pan, and shield plates, a steel framed skid is required. The skid will be designed using structural tube members.

A fabric structure will be used as a weather enclosure to house the consolidation tank system.

See Figure 1 for the consolidation tank layout with the secondary containment pan and support skid.

6. DESIGN AND ANALYSIS

The following is a description of the design and analysis calculations included in this EDF:

Attachment 1 contains the design calculations for the secondary containment pan.

Attachment 2 contains the design of the tank shield plates and supporting frame.

Attachment 3 contains the design of the tank support skid (or frame) for distributing the loads from the tanks to the ground.

Attachment 4 contains an evaluation of the ground stability and required gravel fill for supporting the tank skid system.

Attachment 5 contains an evaluation of tank stability considering minimum seismic activity.

Attachment 6 contains an analysis of an access/walkway platform designed for a mockup of the V-tank cleaning operation.

Attachment 7 contains design drawings.

7. LOADS

Gravity, wind and seismic loadings are considered in the analysis and design calculations of this EDF. Loads are defined in the analysis and/or design of each component.

8. ASSUMPTIONS

The following assumptions are used in the design and analysis calculations:

- The new consolidation tanks will each have four legs.
- The weight of the consolidation tanks is estimated since they have not been purchased at this time.
- The consolidation tanks will be located in an enclosure.

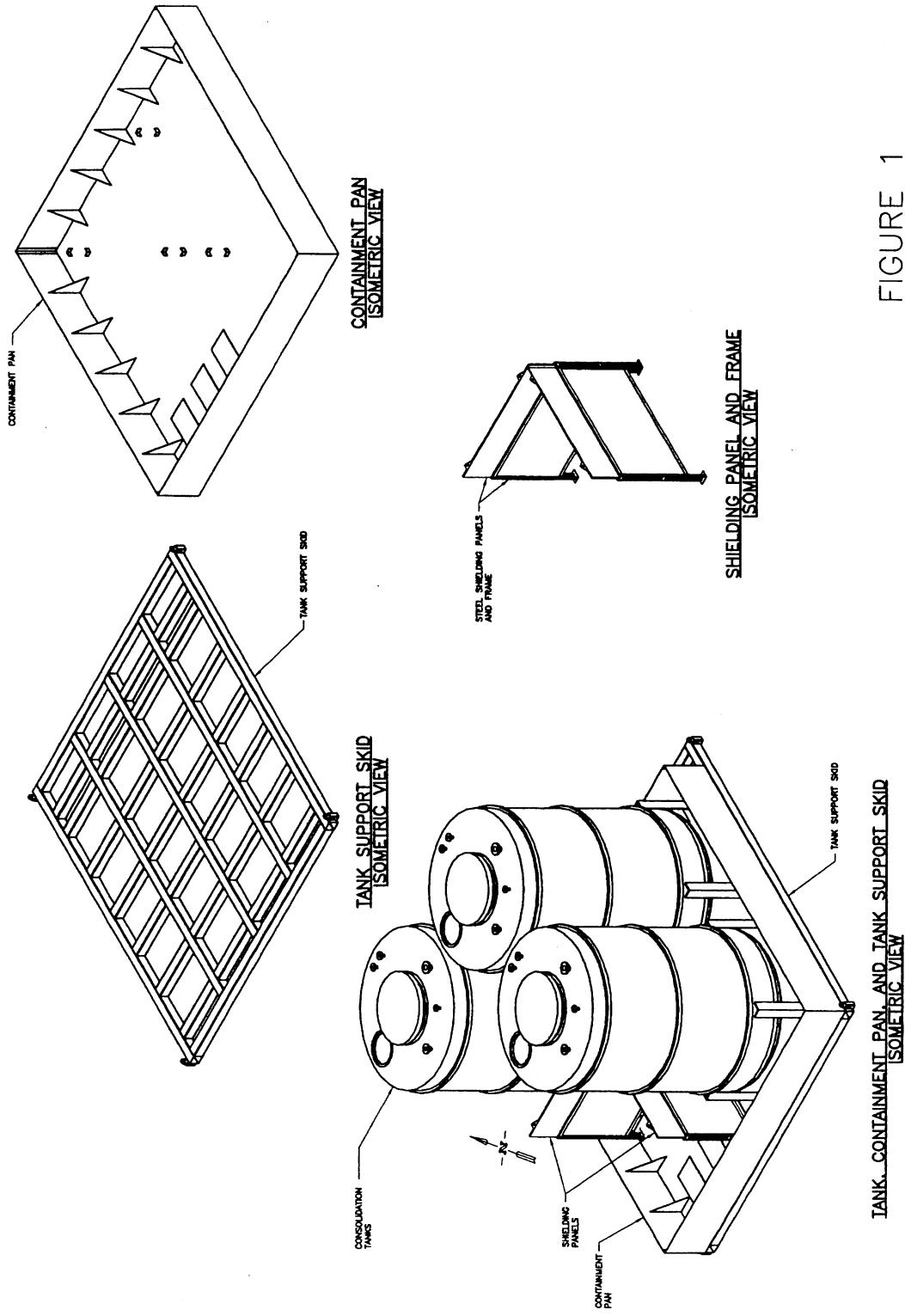


Figure 1. Consolidation tank layout.

FIGURE 1

9. ACCEPTANCE CRITERIA

Structural steel design shall meet AISC criteria for Allowable Stress Design (ASD), (see Reference 2).

10. RESULTS

Attachment 1 contains the design calculations of the containment pan. It will be approximately 21-ft square with walls 3 ft high. It will be constructed from 3/16-in. ASTM A36 carbon steel plate with plate stiffeners placed along the walls.

Steel plates will be positioned near the tanks for radiation shielding. The plates are to be 1-1/4 in. thick (see Reference 7). The design of the frame to support the shielding plates is provided in Attachment 2. The frame consists of $2 \times 2 \times 3/16$ -in. structural tube and is designed to allow the shield plates to slide in and out. Lifting eyes are designed for lifting the plates.

The design of the tank support frame (or skid) is in Attachment 3. The frame is to be constructed using $8 \times 8 \times 1/4$ -in. structural tube. The frame will support the consolidation tanks, the containment pan, and shield plates. Lifting eyes are designed to lift the frame with the pan and shield plate supporting frame (excluding the 1-1/4-in. thick shield plates).

The consolidation tank system will be placed on the ground. Calculations in Attachment 4 indicate that 3 ft of pit run gravel compacted over the existing soil will produce sufficient support for the tanks, maintaining a safety factor of 2.5.

Stability of the consolidation tanks is evaluated for minimal seismic loading. Calculations of Attachment 5 determine that the tanks will not tip over when subjected to IBC (see Reference 12) seismic forces. The tip-over safety factor is 2.3.

Included in this EDF is a structural analysis of a platform to be used during a mockup endeavor for demonstrating and verifying V-tank cleaning procedures and activities. Beams and columns for the platform will be structural steel tube, and the deck will be steel grating. The deck will be 12 ft square and stand just under 12 ft high. The analysis, in Attachment 6, indicates that the platform designed by Brian Raivo is more than sufficient to support the anticipated loads.

11. REFERENCES

1. TFR-278, "Technical and Functional Requirements for Tank/Contents Removal and Site Remediation of V-Tanks, TSF-09 and TSF-18, Operable Unit 1-10," Revision 2, June 22, 2004.
2. American Institute of Steel Construction (AISC) Manual of Steel Construction, Allowable Stress Design, 9th Edition, 1989.
3. Roark's Formulas for Stress & Strain, W. C. Young, Sixth Edition, McGraw-Hill, Inc., 1999.
4. Section Maker, Version 8.53, Formation Design Systems, section geometric properties software for the PC platform.
5. STAAD. Pro, Version 2004, Build 1002, Research Engineers International, structural analysis and design software for the PC platform.

6. RAM Advanse, student version, RAM International, structural analysis and design software for the PC platform.
7. EDF-4604, "Shielding and Exposure Calculations for V-Tank Waste Process Activities," Revision 0, April 19, 2004.
8. 40 CFR 264.193, "Containment and Detection of Leaks," *Code of Federal Regulations*, Office of the Federal Register, June 25, 2004.
9. Design of Welded Structures, O. W. Blodgett, 12th printing, March 1982.
10. DOE-ID Architectural Engineering Standards, Revision 29, U.S. Department of Energy Idaho Operations Office, Idaho Falls, ID, September 12, 2002.
11. Principles of Geotechnical Engineering, B. M. Das, Second Edition, PWS-Kent Publishing Co., 1985.
12. International Building Code, International Code Council, Inc., 2003.
13. American Concrete Institute, ACI 360R-92 (Reapproved 1997), "Design of Slabs on Grade".
14. DOE-STD-1020-2002, "Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities", U.S. Department of Energy, Washington, D.C. 20585, January 2002.

431.02
01/30/2003
Rev. 11

ENGINEERING DESIGN FILE

EDF-5017
Revision 1
Page 9 of 148

Attachment 1
Secondary Containment Pan Design

SECONDARY CONTAINMENT PAN

A metal pan will be sized to contain the contents of 1 tank, nominal capacity of 8000 gal, for secondary containment; consider floor area of pan to be $21' \times 21'$, min.

$$8000 \text{ gal} = 1069.4 \text{ ft}^3 \quad \text{pan floor area} = A = 21^2 = 441 \text{ ft}^2$$

$$\text{min. ht of pan} = h = 1069.4 / 441 = 2.4' \quad \text{say } 3.0' \text{ wall}$$

$$\text{pan vol.} = (21)^2(3) = 1323 \text{ ft}^3 = 9896 \text{ gal}$$

subtract vol. of tank bottoms of 2 non-leaking tanks:

tank bottoms to be dished so conservatively assume ea. tank bott to = Vol. of 1 ft depth of tank cyl. (see tank diag in Att'mt 7)

$$V_d = 2(\pi)(10')^2/4 = 157 \text{ ft}^3 = 1175 \text{ gal}$$

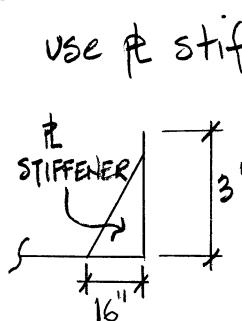
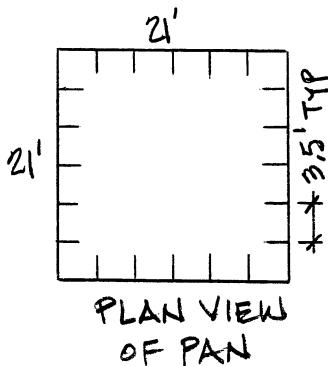
subtract vol of 3 pumps, assume 1' wide $\times 1'$ dp $\times 5'$ lg for ea. pump:

$$\text{Vol.} = 3(1)(1)(5) = 15 \text{ ft}^3 = 112 \text{ gal.}$$

Subtract vol of piping & other accessories, assume 5 x pump vol.:

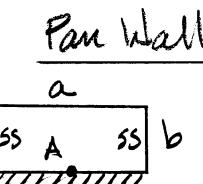
$$\text{Vol.} = 5(112) = 560 \text{ gal.}$$

$$\text{Net pan Vol.} = 9896 - 1175 - 112 - 560 = 8050 \text{ gal.} \therefore 3' \text{ wall OK}$$

Check Pan For Hydrostatic Loads

use # stiffeners to reinforce pan walls

A36 # for pan & stiffeners



use Roark Table 26
Case 7d (Ref. 3)

$$a = 3.5' = 42'' \quad t = 0.188''$$

$$b = 3' = 36''$$

$$a/b = 1.17 \therefore \beta = 0.39$$

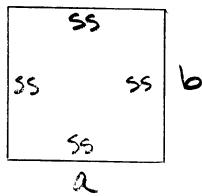
$$q = 62.4(36)/12^3 = 1.30 \text{ psi/in}$$

$$\text{max } \sigma \text{ (at A)} = \frac{\beta q b^2}{t^2} = \frac{.39(1.3)(36)^2}{(.188)^2} = 18600 \text{ psi} < F_b = .75 F_y = 27000 \text{ psi}$$

Pan Floor

pan will sit on structural framing for support,
assume max. spacing of framing of 5'

use Roark Table 26 Case 1a (Ref. 3)



$$a = b = 5' = 60'' \quad t = 0.188''$$

$$q_1 = 1.083 \text{ psi}$$

$$a/b = 1.0 \quad \therefore \beta = 0.2874$$

$$\text{max } \sigma = \frac{\rho q_1 b^2}{t^2} = \frac{0.2874 (1.083)(60)^2}{(0.188)^2} = 31700 \text{ psi} > F_b$$

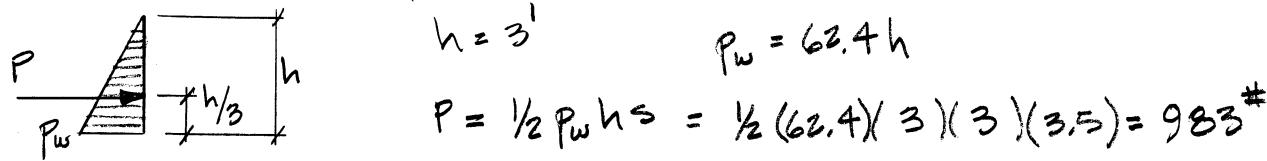
try $a = 60'' \neq b = 42''$, then $a/b = 1.43 \quad \therefore \beta = 0.463$

$$\text{max } \sigma = \frac{0.463 (1.083)(42)^2}{(0.188)^2} = 25030 \text{ psi} < F_b \quad \text{OK}$$

frame spacing of 3'-6" x 5'-0" is OK

Check stiffeners

$$\text{stiffener spacing} = s = 3.5'$$



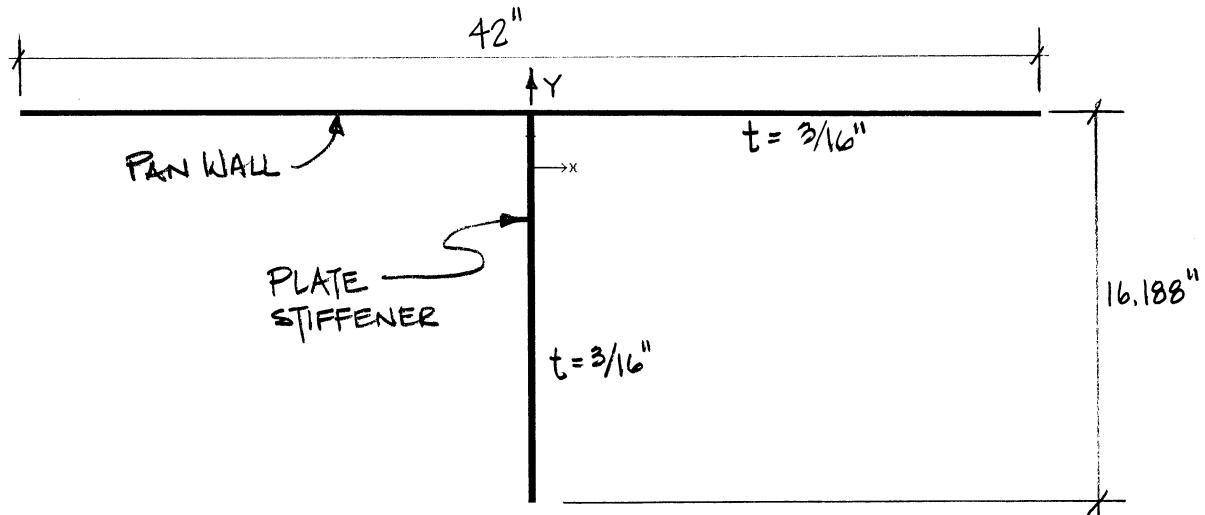
$$h = 3' \quad P_w = 62.4 h$$

$$P = \frac{1}{2} P_w h s = \frac{1}{2} (62.4)(3)(3.5) = 983 \text{ #}$$

$$M = P \left(\frac{h}{3}\right) = 983 (3)(12)/3 = 11800 \text{ "#}$$

for sect. mod. of stiffener see next pg, $S = 14.9 \text{ in}^3$

$$f_b = \frac{M}{S} = \frac{11800}{14.9} = 792 \text{ psi} \quad \text{very small so OK} \quad (F_y = 36000 \text{ psi})$$



CROSS-SECTION OF PAN WALL & PLATE STIFFENER

Weight	37.104	lb/ft
Area	10.904	in ²
I _x	206.894	in ⁴
I _y	1160.721	in ⁴
J	0.128	in ⁴
E	29000.000	ksi
G	11153.846	ksi
S _x	88.917	in ³
* S _x b	14.926	in ³
S _y	55.272	in ³
S _y r	55.272	in ³
r _x	4.356	in
r _y	10.317	in
I _x c	206.894	in ⁴
I _y c	1160.721	in ⁴
I _x y _c	0.000	in ⁴
I ₁	1160.721	in ⁴
I ₂	206.894	in ⁴
Ø	-90.000	deg
x _c	0.000	in
y _c	0.000	in
D	16.188	in
B	42.000	in
t _w	0.188	in
t _f	0.188	in
x _l	-21.000	in
x _r	21.000	in
y _t	2.327	in
y _b	-13.861	in
A _s x	7.896	in ²
A _s y	3.043	in ²
S ₁ t	55.272	in ³
S ₁ b	55.272	in ³
S ₂ l	88.917	in ³
S ₂ r	14.926	in ³
Fillet Radius	0.000	in
Toe Radius	0.000	in
x _s	0.000	in
y _s	2.233	in
Perimeter	116.376	in
d ₁	0.000	in
d ₂	0.000	in
b ₁	0.000	in
b ₂	0.000	in

SECTION MAKER (Ref. 4)

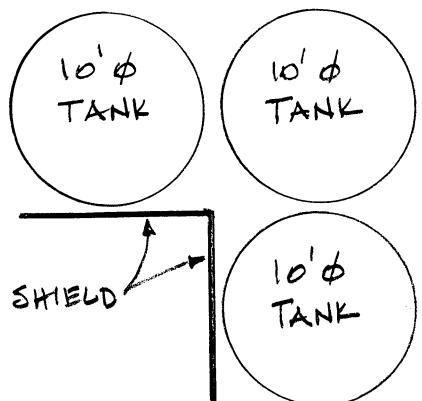
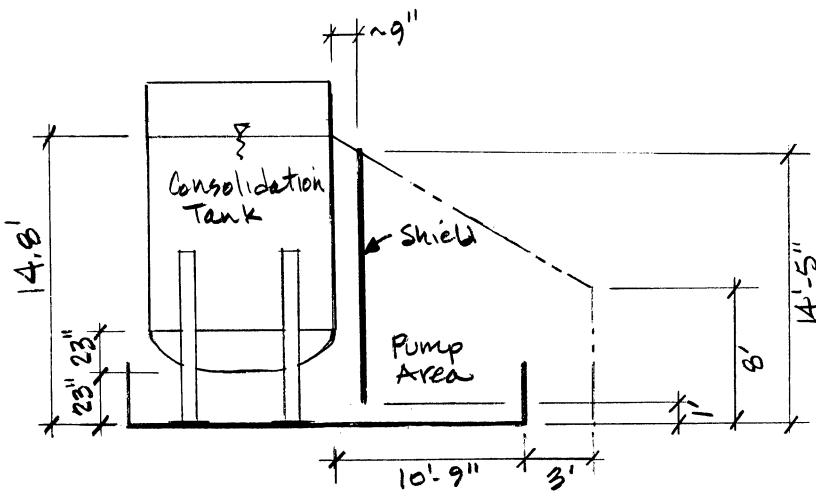
431.02
01/30/2003
Rev. 11

ENGINEERING DESIGN FILE

EDF-5017
Revision 1
Page 13 of 148

ATTACHMENT 2

Tank Shield and Support Frame Design

TANK SHIELDPLAN VIEWELEV. VIEWTank Contents Height

$$100\% \text{ full} = 8000 \text{ gal}$$

$$90\% \text{ full} = 7200 \text{ gal}$$

shield to protect pump area with tank at 90% full

$$\begin{aligned} \text{assume bottom head is elliptical, } V &= 0.5 \left(\frac{4}{3}\pi r^2 b\right) = \frac{4}{6}\pi \left(\frac{10'}{2}\right)^2 \left(\frac{23}{12}\right) \\ &= 100.36 \text{ ft}^3 \\ &= 750 \text{ gal} \end{aligned}$$

$$\begin{aligned} \text{Vol. of tank cyl.} &= \frac{\pi}{4} (10')^2 = 78.54 \text{ ft}^3/\text{ft} \\ &= 587.5 \text{ gal}/\text{ft} \end{aligned}$$

$$\text{Vol of contents in cyl. at 90\%} = 7200 - 750 = 6450 \text{ gal}$$

$$\text{Ht of 90\% full} = \frac{2(23)}{12} + \frac{6450}{587.5} = 14.8'$$

If line of sight from 90% level is to a pt. located 8' high & 3' outside of containment pan, then personnel inside pump area will be shielded. Ht of shield reqd is 14'-5".

Determination of shield thickness for different materials is provided by Ref 7 (EDF-4604), see attached dose rate graphs (pgs 17-21).

Mat'l	req'd thk (in)	density (pcf)	unit wt (psf)
steel	1.25	0.284	51.05
tungsten	0.44	0.697	44
aluminum	3.5	0.098	49.4
concrete	4.125	0.0868	51.6
lead	0.625	0.41	37

Based on factors of size, cost, accessibility & disposability, steel # will be used for shielding.

use 2 shield #'s, ea. $13.5'' \times 10'$

$$\# \text{ wt} = 13.42(10)(51.05) = 6851^{\#} \quad \text{use } 6860^{\#}$$

Design 2 lifting lugs for ea. shield # & a frame to support #'s near the consolidation tanks

LIFTING LUG (see Ref. 2 for AISC refs)

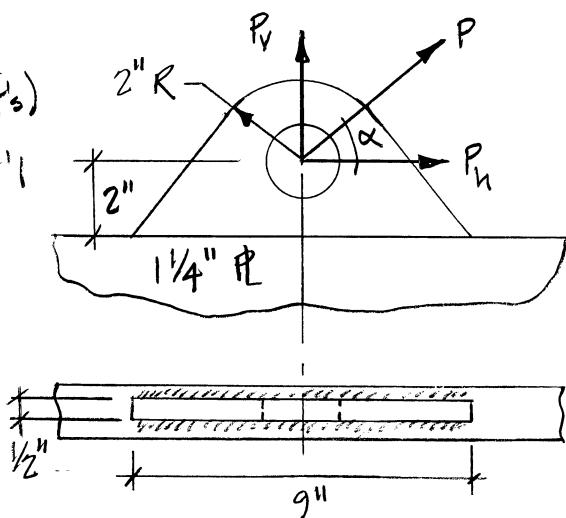
Try $\frac{1}{2}''$ thk lug w/ $2''$ hole, A36 mat'l

let ea. lug support $\#$ wt

$$P_V = 6860^{\#} = 6.86^{\#}$$

assume $\alpha = 45^{\circ}$

$$P = 9.7^{\#} \Rightarrow P_h = 6.86^{\#}$$



Check Net Area for Tension

$$F_t = 0.45 F_y = .45(36) = 16.2 \text{ ksi} \quad (\text{AISC D3.1})$$

$$f_t = 9.7 / (.5)(4.2) = 9.7 \text{ ksi} < F_t \quad \text{OK}$$

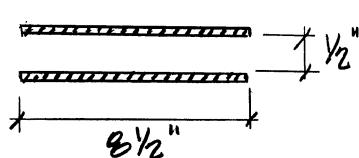
$$\text{req'd net area} = 9.7 / 16.2 = 0.60 \text{ in}^2$$

Check Area for Brg Shear & Hoop Tension

$$\text{req'd area} = \frac{2}{\sqrt{3}} (0.60) = 0.40 \text{ in}^2 \quad (\text{AISC D3.2})$$

$$\text{net area of } \frac{1}{2}'' \text{ lug} = 0.5(2 - \frac{2}{2}) = 0.5 \text{ in}^2 > 0.40 \text{ in}^2 \quad \text{OK}$$

Check Lug Weld



$$A_w = 2(8.5) = 17 \text{ in}^2/\text{in}$$

$$S_w = \frac{d^2}{3} = \frac{8.5^2}{3} = 24.1 \text{ in}^3/\text{in}$$

$$\text{moment on weld} = M = 2.5 P_h = 2.5(6.86) = 17.2 \text{ k-in}$$

$$\text{shear on weld} = V = P_h = 6.86 \text{ k}$$

$$\text{tension on weld} = F = P_v = 6.86 \text{ k}$$

$$\text{tensile stress} = f_t = \frac{F}{A_w} + \frac{M}{S_w} = \frac{6.86}{17} + \frac{17.2}{24.1} = 1.12 \text{ k/in}$$

$$\text{shear stress} = f_v = \frac{V}{A_w} = \frac{6.86}{17} = 0.40 \text{ k/in}$$

$$f_r = (f_t^2 + f_v^2)^{1/2} = 1.19 \text{ k/in}$$

For E70 weld mat'l, allowable stress on 1" fillet weld is

$$f_a = 0.3(70)(1)(0.707) = 14.8 \text{ k/in}$$

$$\text{req'd weld size} = 1.19 / 14.8 = 0.080'' \quad \text{use } \frac{3}{16}'' (0.188) \text{ fillet}$$

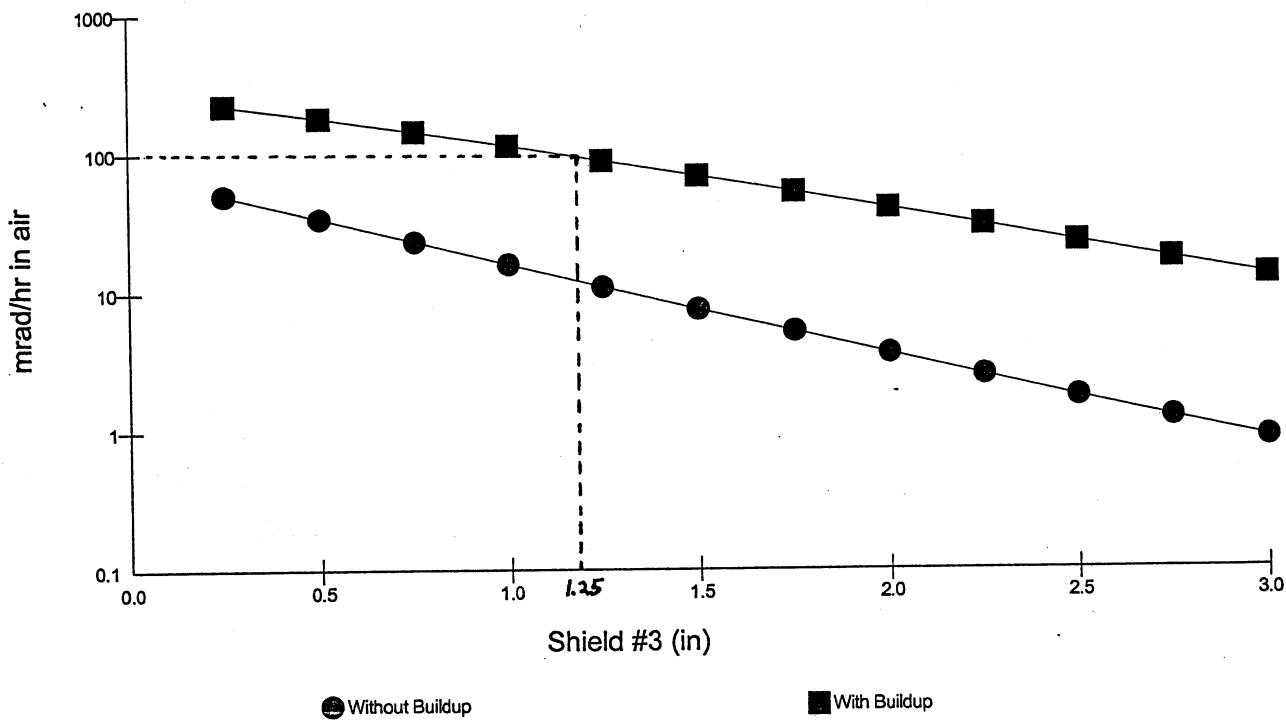
EDF-5017 Rev1

Dose Point @ 3 ft
Fe SHIELD (STEEL)
100 mR/hr @ $\approx 1.25''$

17/148

Robert Miller

TAN V tank Process
Dose Point 2 - (102.5, 1.92e+01, 0) in

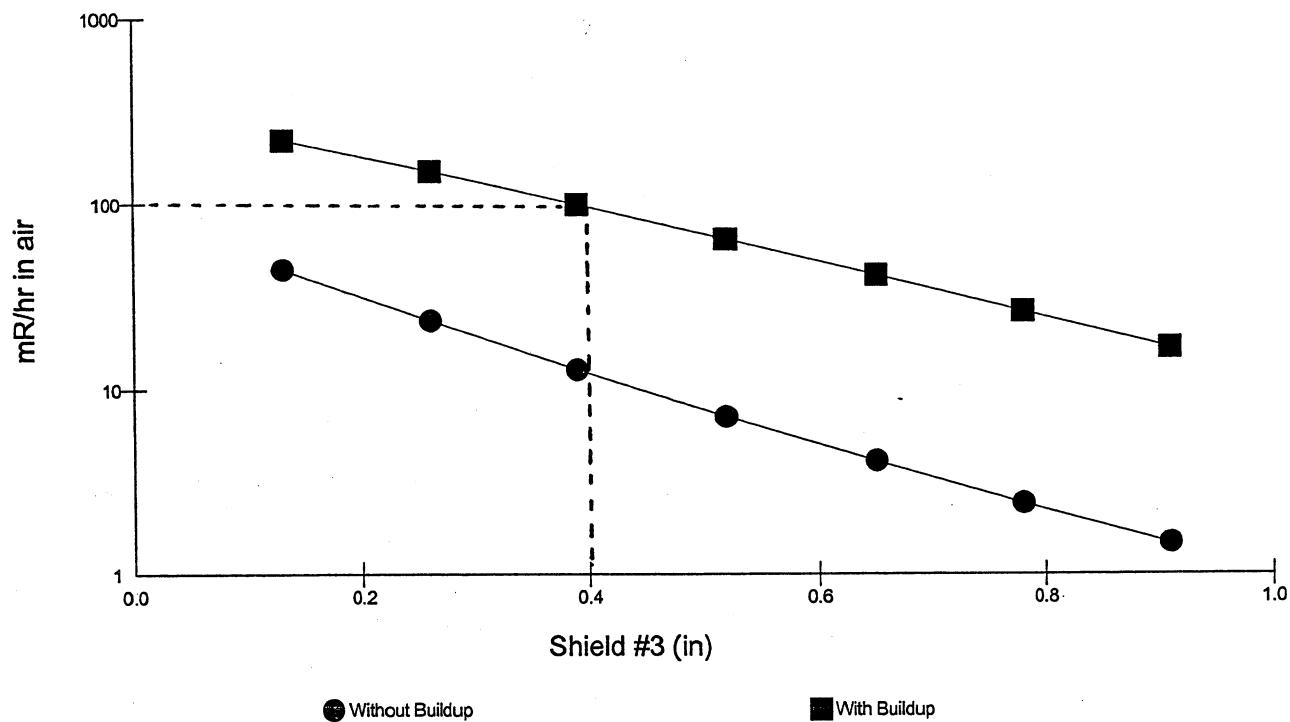


EDF-5017 Rev1

Dose Point @ 3 ft
W Shield (Tungsten)
100 mR/hr @ $\approx \frac{7}{16}$ "

18/148

TAN V tank Process
Dose Point 2 - (102.5, 1.92e+01, 0) in

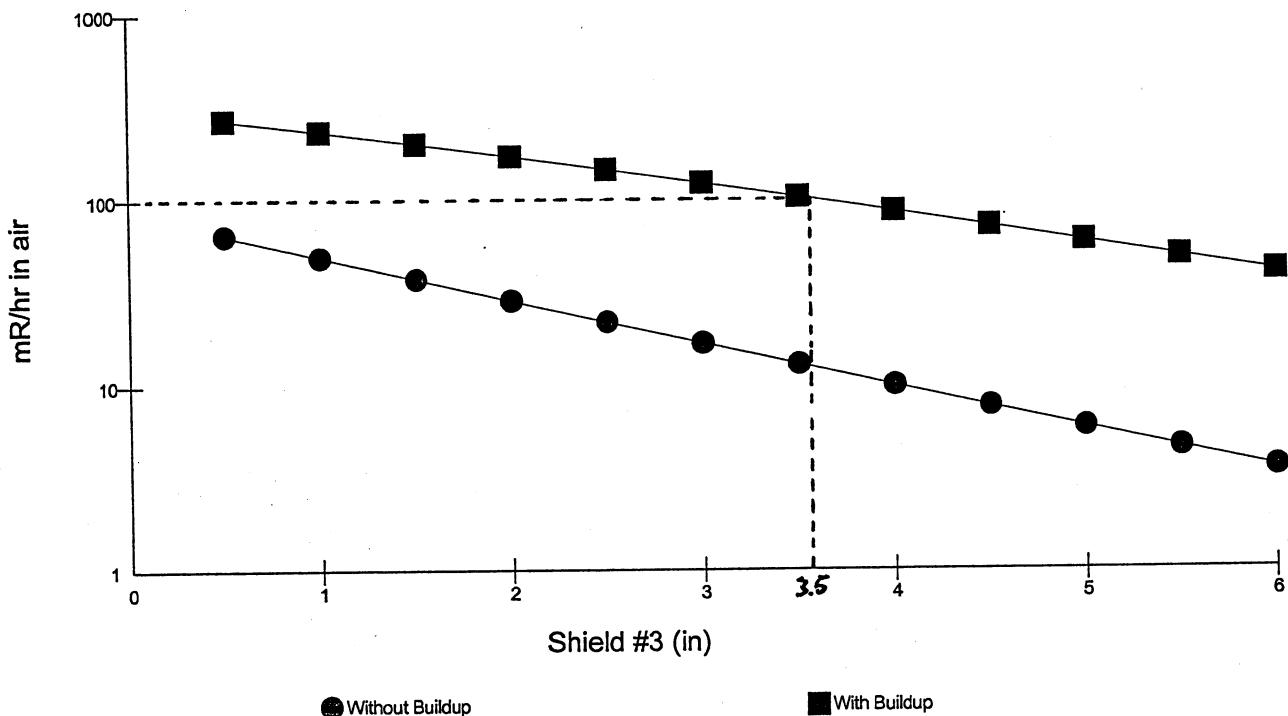


EDF-5017 Rev 1

Dose Point @ 3 ft
Al Shield (Aluminum)
100 mR/hr @ \approx 3.5"

19/148

TAN V tank Process
Dose Point 2 - (102.5, 1.92e+01, 0) in



EDF - 5017 Rev 1

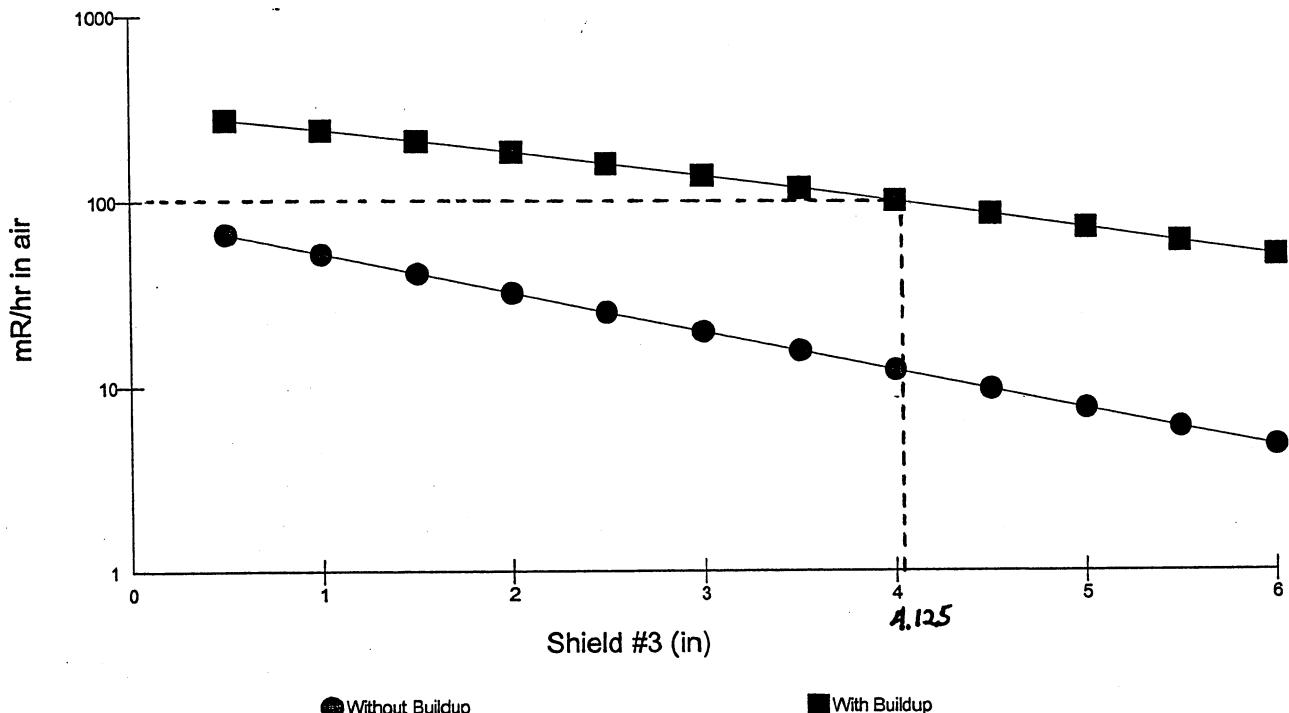
Dose Point @ 3 ft

20/148

CONCRETE SHIELD

100 mR/hr @ $\approx 4.125''$

TAN V tank Process
Dose Point 2 - (102.5, 1.92e+01, 0) in



EDF - 5017 Rev 1

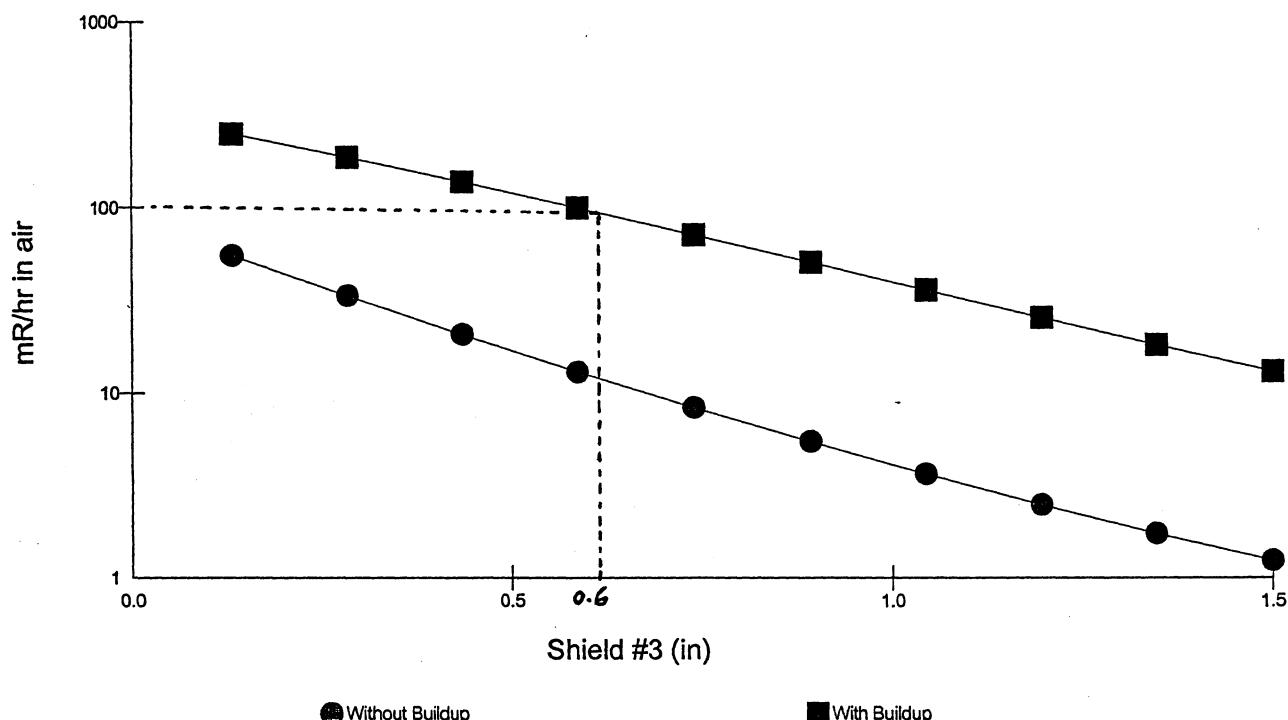
21/148

Dose Point @ 3 ft

Pb SHIELD (Lead)

100 mR/hr with $\approx \frac{5}{8}$ "

TAN V tank Process
Dose Point 2 - (102.5, 1.92e+01, 0) in



TANK SHIELD SUPPORT FRAME

A support frame is req'd for the shield pl's to hold the pl's vertically near the Consolidation Tanks.

The frame is designed to allow shield pl's to slide in & out, & not be attached to the frame.

Frame Members

Col. - HSS $2 \times 2 \times \frac{3}{16}$	}	ASTM A500 Gr B, $F_y = 46 \text{ ksi}$
HSS $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{16}$		
Bms. - HSS $3 \times 1\frac{1}{2} \times \frac{3}{16}$		
Braces - HSS $2 \times 2 \times \frac{3}{16}$		

Loads

DL - self wt of frame & shield pl's

Lateral - design is PC-0, although no requirements per

DOE-STD 1020, will use IBC criteria for wind & seismic loading similar to PC-1

Seismic - $V = 0.108g$ see attached pgs (Microsoft EXCEL)

Wind - 8.5 psf, see attached calcs

Although shielding will be enclosed in bldg, it will be erected prior to the bldg placement, exposing the shielding structure to a relatively short period of time to wind loading. For this situation the wind speed used for calc of wind pressure is 47 mph, which is peak wind gust at 20-ft level at TAN from Ref. 13.

2003 IBC SEISMIC DESIGN LOADS

Project : V-Tank Consolidation Tanks at TAN
Structure: Steel Shield Wall at Consolidation Tanks
Designer : R. F. Lippert, P.E.
Remarks : PC-1 at TAN On Soil Layer > 10 Ft & < 50 Ft

NPH Performance Category, PC-1 or PC-2?	PC =	1	*
INEEL Facility (ANL,CFA,INTEC,NRF,RWMC,TAN,TRA,PBF,Idaho Falls):	Facility =	TAN	*
Seismic Use Group ("I" for PC-1 or "III" for PC-2 per DOE-STD-1020):	SUG =	I	
Importance Factor (1.0 for PC-1 or 1.5 for PC-2 per DOE-STD-1020):	I =	1.0	

Mapped Spectral Accelerations (IBC 1615.1 and DOE-ID AE Standards) :

Mapped Spectral Accelerations (g's)				
Facility	Latitude	Longitude	Short Periods S_S	1-Sec Period S_1
TAN	43.847	112.707	0.405	0.148

Site Parameters (IBC 1615.1.2 and DOE-ID AE Standards) :

Soil layer depth below structure, d = **40.0 ft** *

Site Class Based On Shear Wave Velocity				
Facility	On Rock	d < 10 ft	10 ft < d < 50 ft	50 ft < d < 80 ft
TAN	B	B	C	D

Site Class = C

Site Coefficient, F_a , for Short Periods			
Site Class	$S_S = 0.25$	$S_S = 0.50$	$S_S = 0.75$
C	1.2	1.2	1.1

$F_a = 1.200$

Site Coefficient, F_v , for 1-Second Period			
Site Class	$S_1 = 0.1$	$S_1 = 0.2$	$S_1 = 0.3$
C	1.7	1.6	1.5

$F_v = 1.652$

Maximum Considered Earthquake Spectral Response Acceleration (IBC 1615.1.2) :

for short periods, $S_{MS} = 0.486$ g's
 for 1-sec period, $S_{M1} = 0.244$ g's

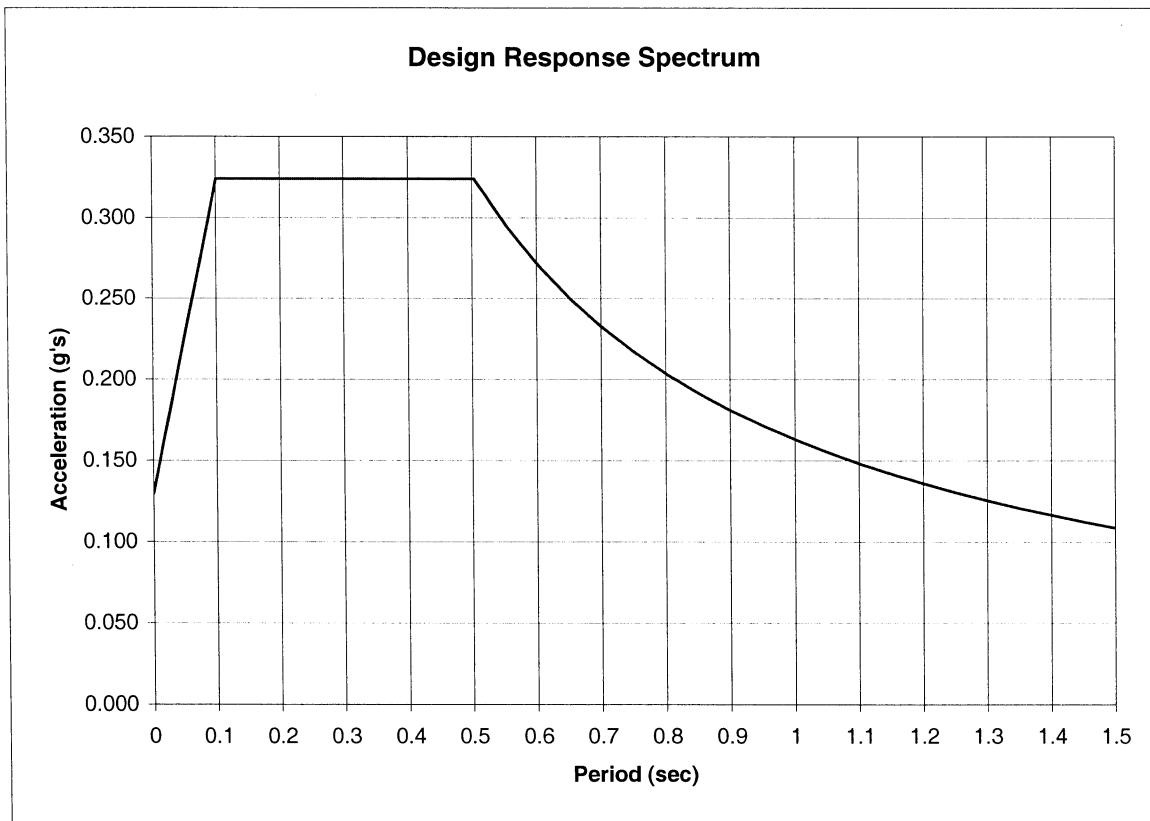
Design Spectral Response Acceleration, 5% damped (IBC 1615.1.3) :

for short periods, $S_{DS} =$	0.324 g's
for 1-sec period, $S_{DI} =$	0.163 g's

Design Response Spectrum Curve (IBC 1615.1.4) :

lowest period at peak acceleration, $T_0 = 0.101$ seconds

greatest period at peak acceleration, $T_s = 0.503$ seconds



Seismic Design Category Determination (IBC 1616.3) :

Spectral Response Acceleration	Seismic Use Group	Seismic Design Category
Value of S_{DS} $0.167g < S_{DS} < 0.33g$	I	B
Value of S_{DI} $0.133g < S_{DI} < 0.20g$		C

Seismic Design Category = **C**

Non-Building Structure -- Equivalent Lateral Force (IBC 1622 & ASCE 9.14)

Base Shear Force (ASCE Eq 9.5.5.2-1) : $V = C_S * W$ (W = structure operating weight)

Base Shear Force for Rigid Structure, T<0.06 sec (ASCE Eq 9.14.5.2) : $V = 0.3 * S_{DS} * W * I$

seismic response coefficient (ASCE Eq 9.5.5.2.1-1) : $C_S = S_{DS} / (R/I_E)$

C_S need not exceed (ASCE Eq 9.5.5.2.1-2) : $S_{DI} / (R/I_E) / T$

C_S shall not be taken less than (ASCE Eq 9.14.5.1-1) : $0.014 * S_{DS} * I$

bldg fund. period, T, taken as the approx. period (ASCE Eq 9.5.5.3.2-1) : $T_a = C_T * h_n^x$

importance factor, I = **1.0**

height of structure to highest level, h_n = **14.0** ft *

response mod. coeff. (from ASCE Table 9.14.5.1.1), R = **3.0** *

bldg period coeff. (ASCE Table 9.5.5.3.2: 0.028, 0.016, 0.03 or 0.02), C_T = **0.020** *

building period exponent (ASCE Table 9.5.5.3.2: 0.8, 0.9, 0.75), x = **0.75**

T_a = **0.145** sec

C_S = 0.108

maximum C_S = 0.375

minimum C_S = 0.045

force for rigid structure (if T < 0.06 sec), V = **0.097** W

Structure Base Shear Force, V = **0.108** W

DOE/ID - 12118

Table A-3. Monthly and period of record peak wind gusts with concurrent wind directions for CFA at 20 and 250 ft. AGL and for TAN at 20 and 150 ft. AGL.

	CFA				TAN			
	20-ft. Level ^a		250-ft. Level ^b		20-ft. Level ^c		150-ft. Level ^d	
	Direction (quad.)	Speed (mph)	Direction (quad.)	Speed (mph)	Direction (quad.)	Speed (mph)	Direction (quad.)	Speed (mph)
January	SW	78	S	75	S	58	NNW	64
February	WSW	60	SW	66	N and SSW	62	SW	59
March	WSW	78	SW	84	N	65	SW	73
April	S	67	SW	62	SSW	60	NW	76
May	SW	62	SSW	67	NNW	60	NNW	66
June	SSW	60	SSW	75	S	67	SW	76
July	N	68	S	66	W	60	W	73
August	WSW	62	SW	72	SSW	64	WSW	68
September	WSW	61	WSW	70	SSW	54	W	73
October	WSW	66	WSW	76	NNW	63	NW	64
November	WSW-SW	60	WSW	70	SW	59	NNW	78
December	SW	64	SSW	80	NNW	62	NNW	68
Period Of Record	WSW	78	SW	84	S	67	NNW	78

- a. Data period of record spans April 1950 through October 1964.
- b. Data period of record spans July 1951 through October 1964.
- c. Data period of record spans July 1950 through April 1961.
- d. Data period of record spans April 1956 through April 1961.

Third, channeled canyon cold air drainage dominates the wind distributions at stations located at the boundaries of mountain valleys and the ESRP. Arco (ARC), Blue Dome (BDM), Monteview (MTV) and TAN (particularly the lower level) are dominated by this flow pattern. The Dunes (DUN), the Naval Reactor Facility (NRF), and Rover (ROV) stations have augmented northwesterly winds which result from the influence of these canyon winds as they flow out onto the ESRP. The other monitoring stations not specifically enumerated above exhibit some or all of the main flow characteristics given in the preceding discussion.

An analysis of wind speed and direction distributions at a given station under specific meteorological conditions enhances understanding of the wind flow regime. Wind roses for the 33 and 200 ft. levels on the Grid 3 (GRD3) tower have been prepared for a two-year period (January 1981 through December 1982). The data were categorized into Pasquill-Gifford stability classes, using measured temperature gradients as defined by the U.S. Nuclear Regulatory Commission (U.S. NRC, 1972). These wind roses are illustrated in Figures A-19 and A-20.

Several conclusions can be drawn from the data stratified in this manner. First, in neutral

2003 IBC WIND DESIGN LOADS

Wind loads are developed in accordance with ASCE Standard 7-02.

WIND PARAMETERS

exposure coefficient (ASCE Table 3) $K_z := 0.85$ for exposure "C"

topographic factor (ASCE Fig 6-4) $K_{zt} := 1.0$

directionality factor (ASCE Table 6-4) $K_d := 0.85$ for solid signs

basic wind speed, mph $V_{\text{avg}} := 67$

importance factor $I := 1.0$

gust effect factor (ASCE 6.5.8) $G_{\text{avg}} := 0.85$

net force coefficient (ASCE Fig) $C_f := 1.2$ for freestanding walls

VELOCITY PRESSURE

$$(\text{ASCE Eq. 6-15}) \quad q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I \cdot \text{psf} \quad q_z = 8.3 \text{ psf}$$

DESIGN PRESSURE

$$(\text{ASCE Eq. 6-25}) \quad P := q_z \cdot G \cdot C_f \quad P = 8.5 \text{ psf}$$

Analysis

STAAD.Pro (Ref. 5) is used to analyze frame

See following pgs for dwgs of frame (Figures 2A & 2B)

Load Combinations

1. DL
2. DL + 0.7E
3. DL + L_v
4. 0.6DL + 0.7E
5. 0.6DL + L_v

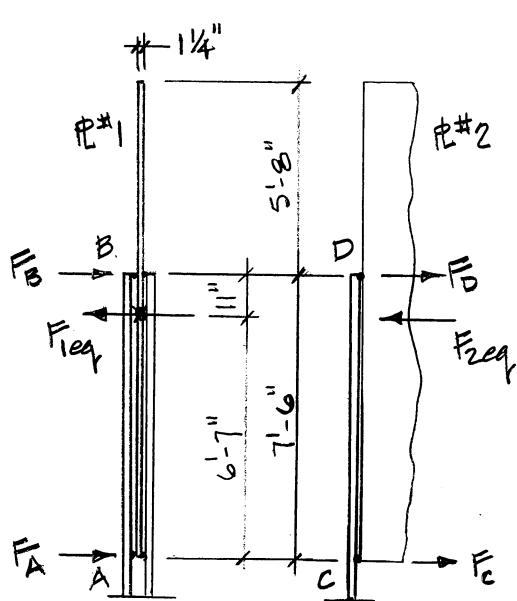
Loads

$$1\frac{1}{4}'' \text{ ft wt} = 51.05 \text{ psf}$$

$$\text{DL} - P^{\#1} \text{ wt} = 9.75(13.17)(51.05) = 6560^{\#}$$

$$P^{\#2} \text{ wt} = 9.42(13.17)(51.05) = 6336^{\#}$$

Seismic - \perp to $P^{\#1}$ \parallel to $P^{\#2}$



$$F_{eq} = 0.108(6560) = 710^{\#} \quad P^{\#1}$$

$$F_{eq} = 0.108(6336) = 685^{\#} \quad P^{\#2}$$

$$w_{1eq} = 710/13.17 = 54 \text{ plf}$$

$$w_{2eq} = 685/13.17 = 52 \text{ plf}$$

$$F_A = \frac{54}{2(7.5)} (7.5^2 - 5.67^2) = 88^{\#}$$

$$F_B = \frac{54}{2(7.5)} (7.5 + 5.67)^2 = 626^{\#}$$

$$F_C = \frac{52}{2(7.5)} (7.5^2 - 5.67^2) = 84^{\#}$$

$$F_D = \frac{52}{2(7.5)} (7.5 + 5.67)^2 = 602^{\#}$$

Wind - on fl #1

$$w = 8.5(9.75) = 84 \text{ plf}$$

$$P_A = \frac{84}{2(7.5)} (7.5^2 - 5.67^2) = 136 \text{ #}$$

$$P_B = \frac{84}{2(7.5)} (7.5 + 5.67)^2 = 972 \text{ #}$$

Results

see attached STAAD.Pro input & output

max. single col. reaction (vert.) = 2855 # at node 5, DL+0.7E

max. displ. = 0.37" in z direction at node 59

for HSS members, max. failure ratio = 0.52 < 1.0 OK
for beam 28 (col.), DL + W

for bar ($\frac{3}{8}'' \times 3''$), max. comb. stress = 13.8 ksi, bm 36
OK since < allowable stress = 24 ksi
for A36 steel

Frame is adequate to support shield plates.

Frame & Fl weight

frame & fl wt = $\sum F_y$ reactions from DL case = 14000 #

$$\text{Fl wt} = 65600 + 63260 = 12900 \text{ #}$$

$$\text{frame wt} = 14000 - 12900 = 1100 \text{ #}$$

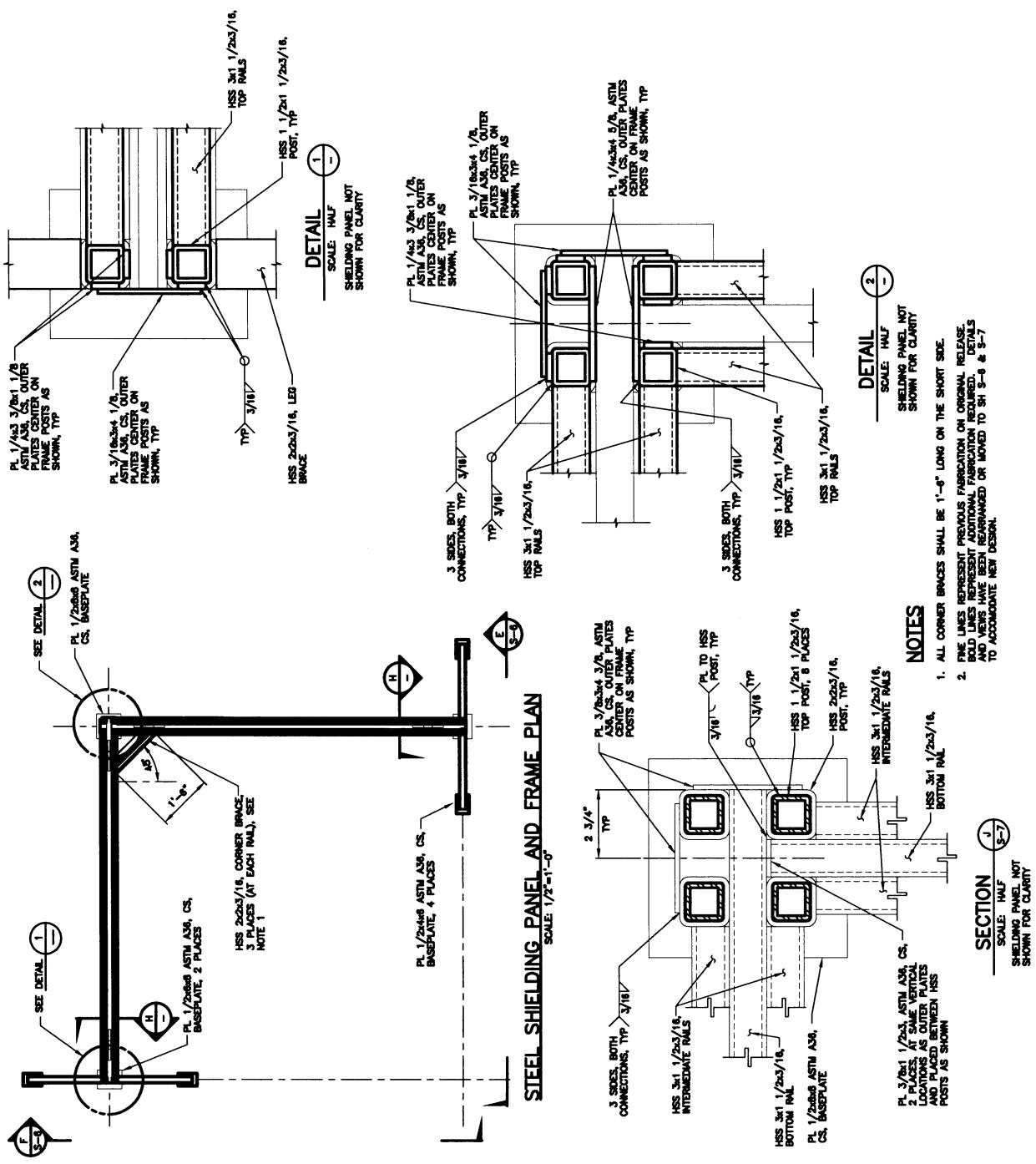
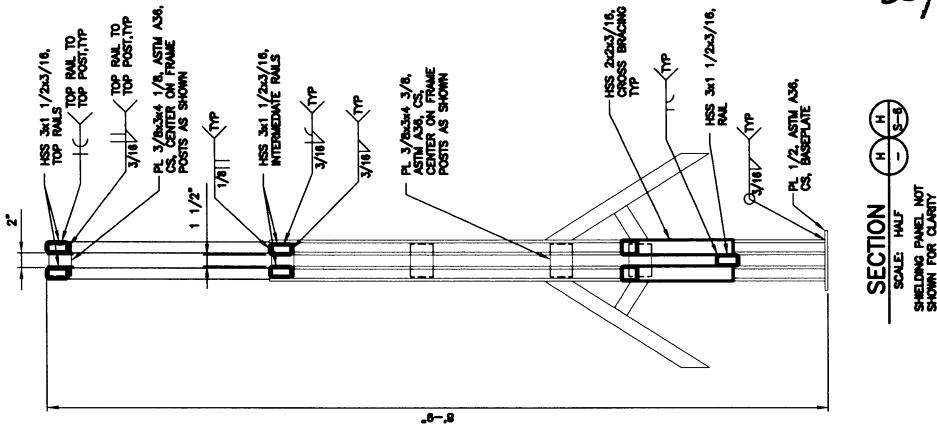
Max. Reaction

max. reaction at base fl is $\sum F_y$ of nodes 3, 4, 5 & 6

$$R = 791 + 1787 + 2855 + 2118 = 7551 \text{ #}, \text{ DL + 0.7E}$$

EDF-5017
Rev. 1

30/148



EDF-5017
Rev. 1

31/148

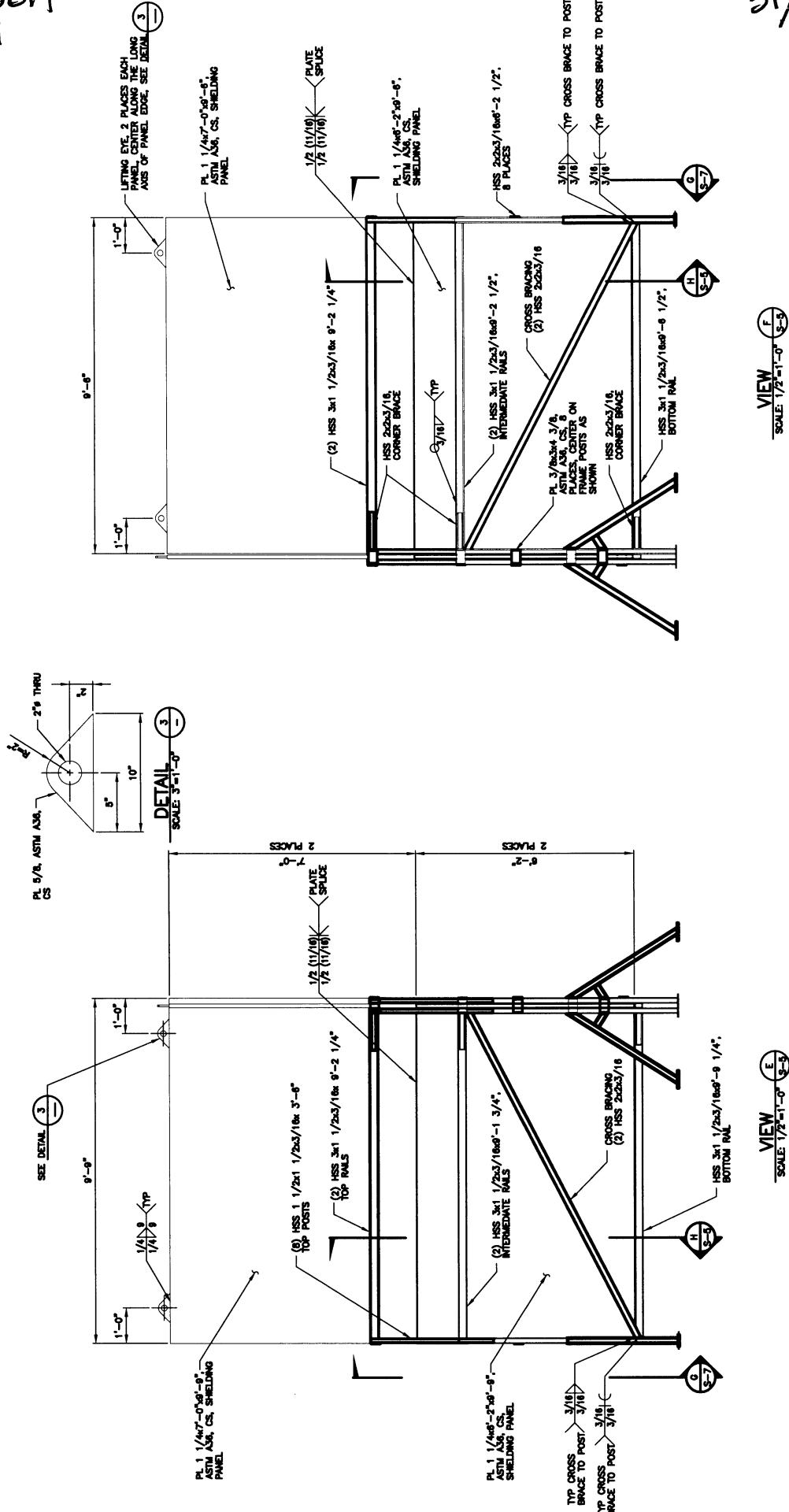


FIGURE 2B

STAAD SPACE STEEL PLATE TANK SHIELD

START JOB INFORMATION

JOB NAME V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

JOB NO EDF-5017 Rev 1

ENGINEER NAME R Lippert

ENGINEER DATE Oct 2004

END JOB INFORMATION

INPUT WIDTH 79

UNIT INCHES POUND

JOINT COORDINATES

1 0 0 0; 2 0 0 3.5; 3 116.5 0 0; 4 116.5 0 3.5; 5 120 0 0; 6 120 0 3.5;
7 116.5 0 120.5; 8 120 0 120.5; 9 0 13.5 0; 10 0 13.5 3.5; 11 116.5 13.5 0;
12 116.5 13.5 3.5; 13 120 13.5 0; 14 120 13.5 3.5; 15 116.5 13.5 120.5;
16 120 13.5 120.5; 17 0 73.5 0; 18 0 73.5 3.5; 19 116.5 73.5 0;
20 116.5 73.5 3.5; 21 120 73.5 0; 22 120 73.5 3.5; 23 116.5 73.5 120.5;
24 120 73.5 120.5; 25 0 13.5 1.75; 26 120 13.5 1.75; 27 118.25 13.5 3.5;
28 118.25 13.5 120.5; 29 0 36 3.5; 30 0 36 0; 31 116.5 36 0; 32 116.5 36 3.5;
33 120 36 0; 34 120 36 3.5; 35 116.5 36 120.5; 36 120 36 120.5;
51 102 73.5 3.5; 52 116.5 73.5 18; 53 103.75 13.5 1.75; 54 118.25 13.5 16.25;
55 0 0 -24; 57 0 24 0; 58 0 27.6923 -5.53846; 59 0 103.5 0; 60 0 103.5 3.5;
61 116.5 103.5 0; 62 116.5 103.5 3.5; 63 120 103.5 0; 64 120 103.5 3.5;
65 116.5 103.5 120.5; 66 120 103.5 120.5; 67 102 103.5 3.5; 68 116.5 103.5 18;
69 0 0 27.5; 70 0 24 3.5; 71 0 27.6923 9.03846; 72 92.5 0 120.5;
73 144 0 120.5; 74 116.5 24 120.5; 75 120 24 120.5; 76 110.962 27.6923 120.5;
77 125.538 27.6923 120.5;

MEMBER INCIDENCES

1 1 9; 2 2 10; 3 3 11; 4 4 12; 5 5 13; 6 6 14; 7 7 15; 8 8 16; 9 9 57;
10 10 70; 11 11 31; 12 12 32; 13 13 33; 14 14 34; 15 15 74; 16 16 75; 17 9 25;
18 13 26; 19 14 27; 20 16 28; 21 25 10; 22 26 14; 23 27 12; 24 28 15; 25 25 53;
26 27 54; 27 29 18; 28 30 17; 29 31 19; 30 32 20; 31 33 21; 32 34 22; 33 35 23;
34 36 24; 35 30 29; 36 17 18; 37 21 19; 38 33 31; 39 21 22; 40 33 34; 41 36 35;
42 24 23; 43 17 19; 44 18 51; 45 20 22; 46 32 34; 47 22 24; 48 20 52; 63 51 20;
64 52 23; 65 51 52; 66 53 26; 67 54 28; 68 53 54; 71 16 22; 72 9 19; 75 57 30;
76 55 58; 77 58 30; 78 57 58; 79 17 59; 80 18 60; 81 19 61; 82 20 62; 83 21 63;
84 22 64; 85 23 65; 86 24 66; 89 59 60; 90 63 61; 91 63 64; 92 66 65; 93 59 61;
94 60 67; 95 62 64; 96 64 66; 97 62 68; 98 67 62; 99 68 65; 100 67 68;
101 70 29; 102 57 70; 103 69 71; 104 71 29; 105 70 71; 106 10 20; 107 15 20;
108 72 76; 109 73 77; 110 74 35; 111 75 36; 112 76 35; 113 74 76; 114 77 36;
115 75 77; 116 74 75;

START USER TABLE

TABLE 1

PRISMATIC

BAR3X3/8

1.125 0.84375 0.01318 0.053 1.125 1.125 3 0.375

END

DEFINE MATERIAL START

ISOTROPIC STEEL

E 2.9e+007

POISSON 0.3

DENSITY 0.283

ALPHA 6.5e-006

DAMP 0.03

END DEFINE MATERIAL

CONSTANTS

MATERIAL STEEL MEMB 1 TO 48 63 TO 68 71 72 75 TO 86 89 TO 116

*HSS 2x2x3/16
MEMBER PROPERTY AMERICAN
1 TO 16 27 TO 34 65 68 71 72 75 TO 78 100 101 103 TO 115 TABLE ST TUB20203
*HSS 3x1-1/2x3/16
MEMBER PROPERTY AMERICAN
17 TO 26 43 44 47 48 63 64 66 67 93 94 96 TO 98 -
99 TABLE ST TUBE30153 TH 0.188 WT 1.5 DT 3
*HSS 1-1/2x1-1/2x3/16
MEMBER PROPERTY AMERICAN
79 TO 86 TABLE ST TUBE15153 TH 0.1875 WT 1.5 DT 1.5
MEMBER PROPERTY AMERICAN
35 TO 42 45 46 89 TO 92 95 102 116 UPTABLE 1 BAR3X3/8
SUPPORTS
1 TO 8 55 69 72 73 PINNED
LOAD 1 FRAME DL
SELFWEIGHT Y -1
LOAD 2 PLATE DL
JOINT LOAD
25 26 FY -3280
27 28 FY -3168
LOAD 3 LOADTYPE None TITLE SEISMIC -Z (0.108 G)
SELFWEIGHT Z -0.108
JOINT LOAD
9 11 FZ -44
59 61 FZ -313
62 64 FZ -301
12 14 FZ -42
LOAD 4 LOADTYPE None TITLE WIND -Z
JOINT LOAD
59 61 FZ -486
JOINT LOAD
9 11 FZ -68
LOAD COMB 5 DL
1 1.0 2 1.0
LOAD COMB 6 DL+0.7E
1 1.0 2 1.0 3 0.7
LOAD COMB 7 DL+W
1 1.0 2 1.0 4 1.0
LOAD COMB 8 0.6DL+0.7E
1 0.6 2 0.6 3 0.7
LOAD COMB 9 0.6DL+W
1 0.6 2 0.6 4 1.0
UNIT INCHES KIP
PERFORM ANALYSIS PRINT ALL
LOAD LIST 5 TO 9
PARAMETER
CODE AISC
LZ 43.27 MEMB 76 77 103 104 108 109 112 114
LY 60 MEMB 9 10 15 16 27 28 33 34 75 101 110 111
FYLD 46 MEMB 1 TO 34 43 44 47 48 63 TO 68 71 72 75 TO 86 93 94 96 TO 101 103 -
104 TO 115
TRACK 2 MEMB 1 TO 48 63 TO 68 71 72 75 TO 86 89 TO 101 103 TO 116
CHECK CODE MEMB 1 TO 48 63 TO 68 71 72 75 TO 86 89 TO 107 110 111
FINISH



Software licensed to INEEL

Job No
EDF-5017 R1

Sheet No
34 of 148

Rev

Job Title **V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING**

Part

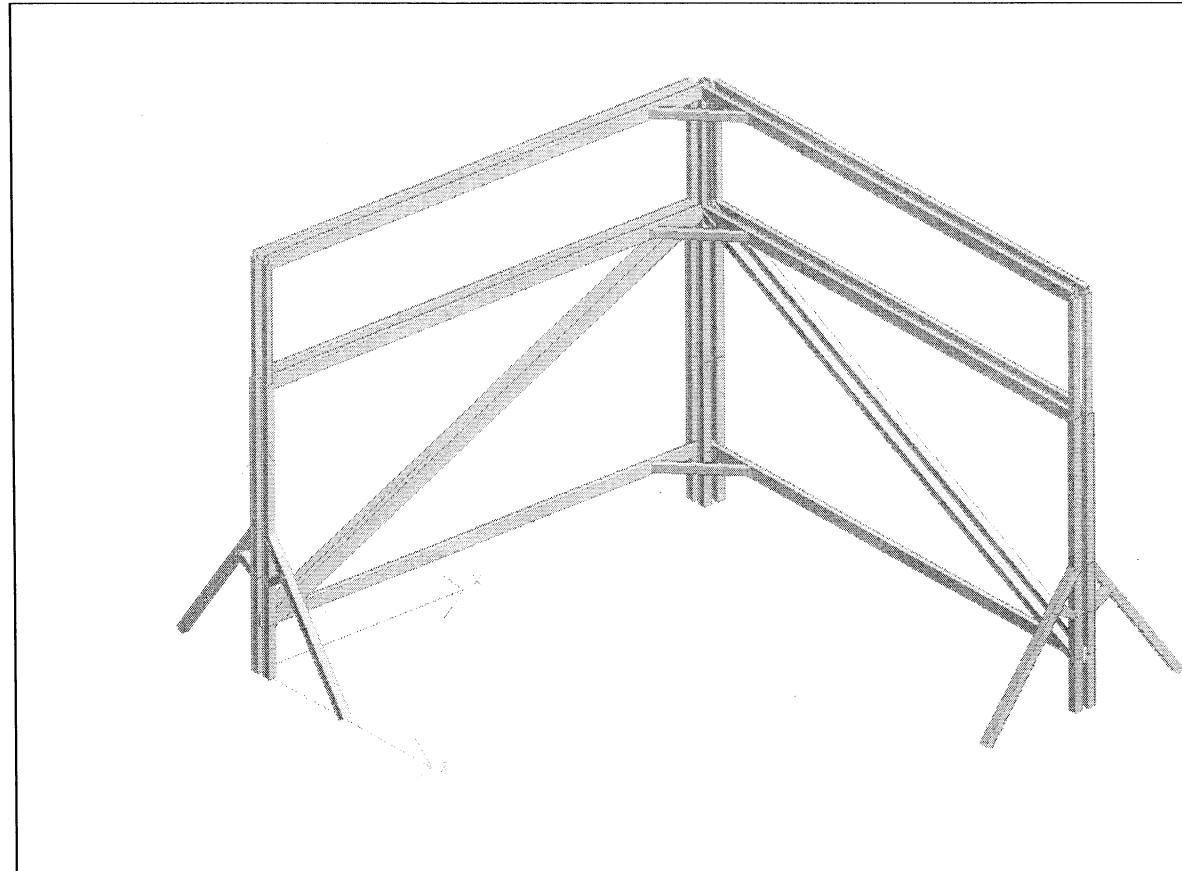
Ref

By **R Lippert** Date **Oct 2004** Chd

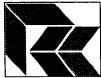
Client

File **TankShield2_modG.std**

Date/Time **15-Nov-2004 16:25**



3D View: Shield Plate Support Frame



Software licensed to INEEL

Job No
EDF-5017 R1

Sheet No
35 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

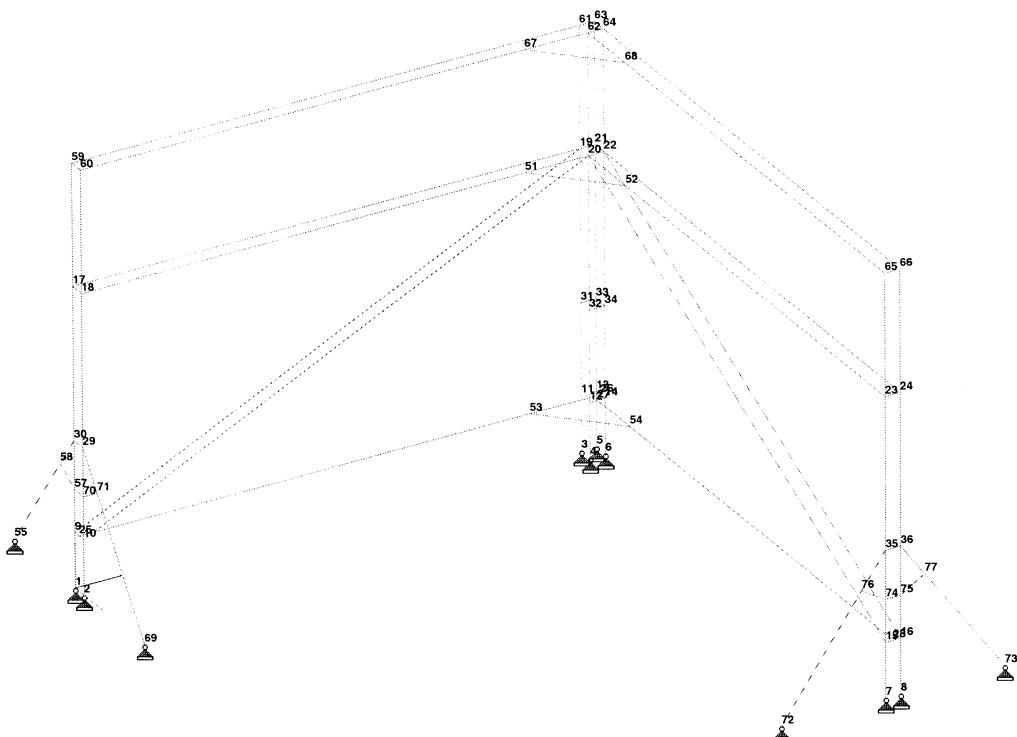
Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25



Node Numbers & Supports



Software licensed to INEEL

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Job No
EDF-5017 R1

Sheet No
36 of 148

Rev

Part

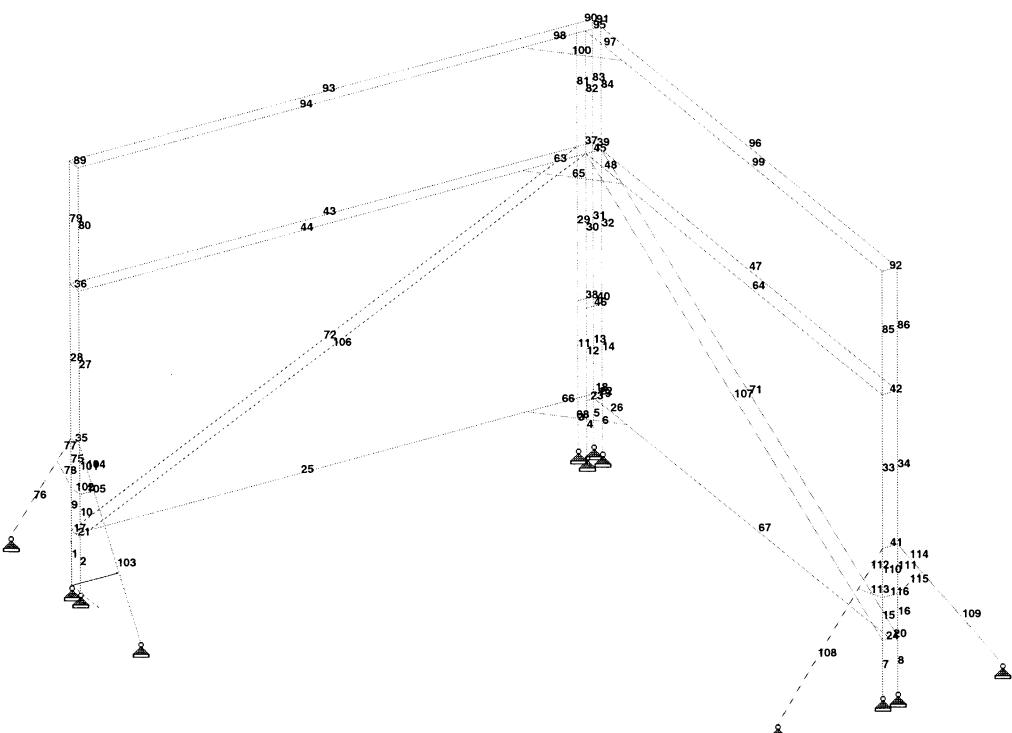
Ref

By R Lippert Date Oct 2004 Chd
File TankShield2.modG.std Date/Time 15-Nov-2004 16:25

Client

File TankShield3.modG.std

Date/Time 15-Nov-2004 16:25



Beam Numbers



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
37 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

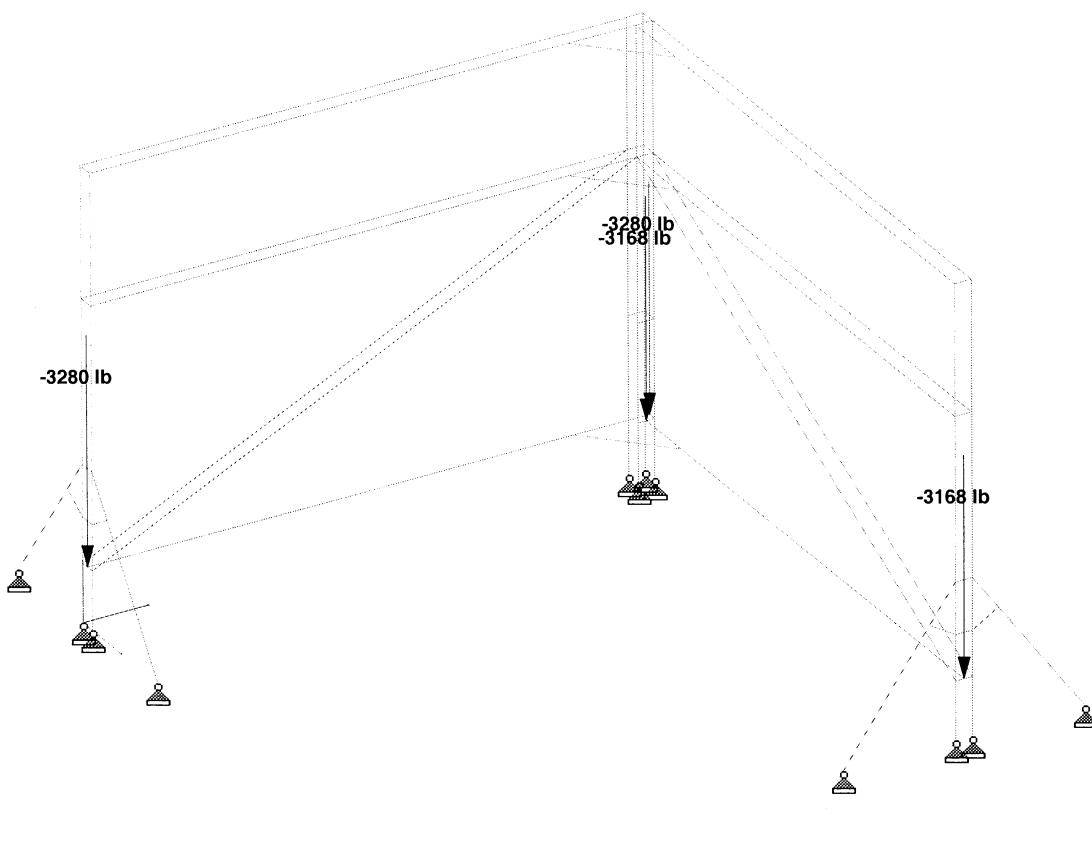
Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25



Shield Plate Weight



Software licensed to INEEL

Job No
EDF-5017 R1

Sheet No
38 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

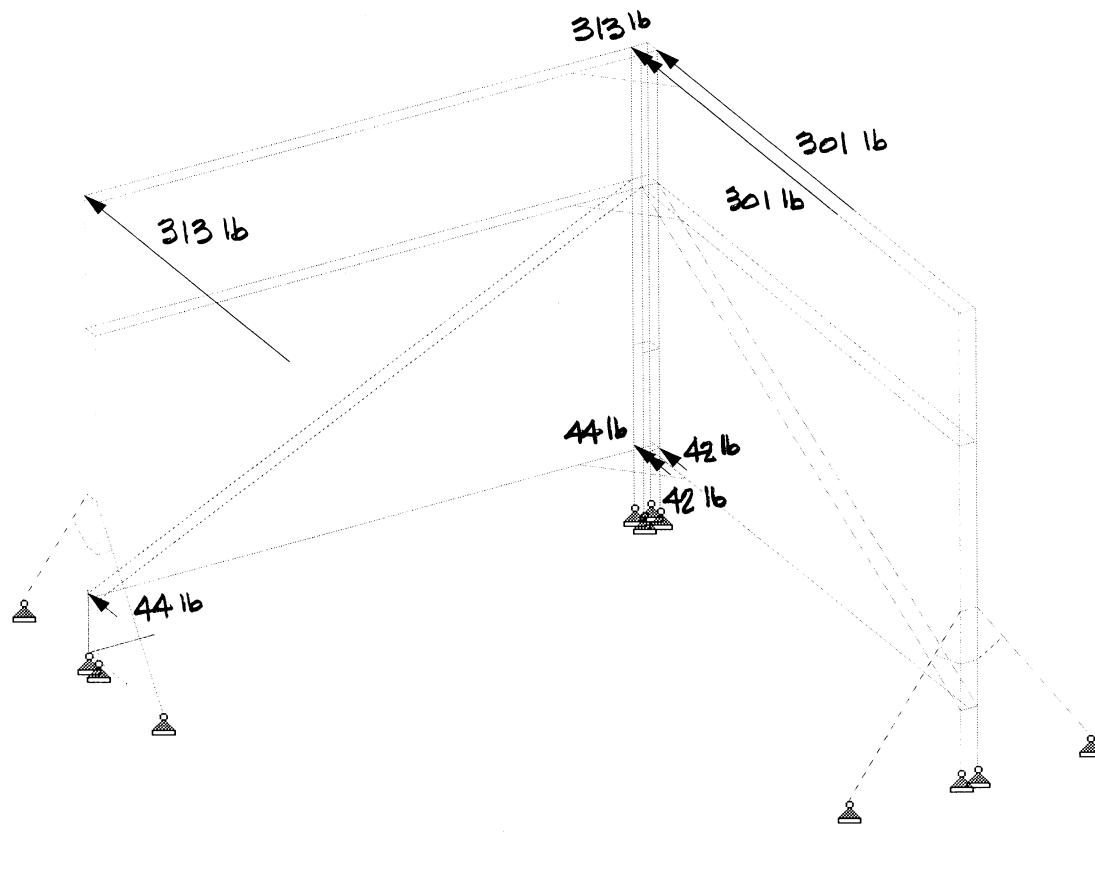
Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25



Seismic Loading in -Z Direction (0.108g)



Software licensed to INEEL

Job No
EDF-5017 R1

Sheet No
39 of 148

Rev

Job Title **V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING**

Part

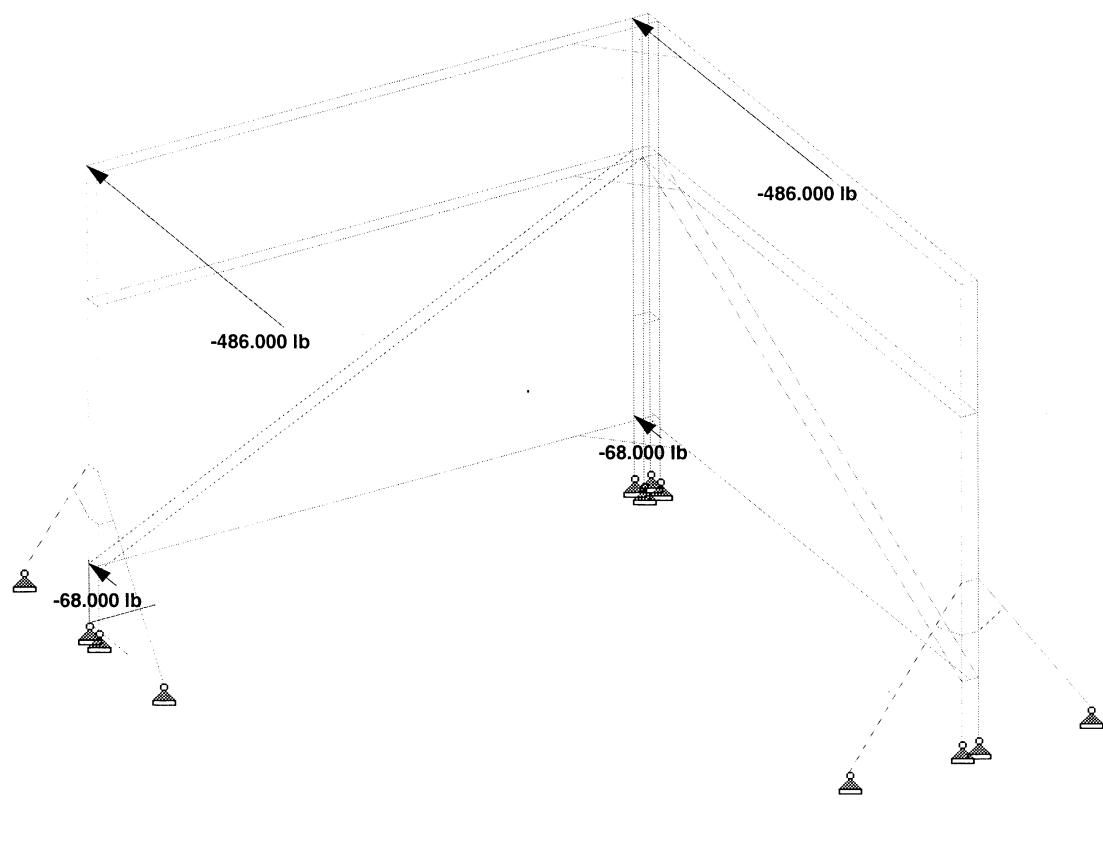
Ref

By **R Lippert** Date **Oct 2004** Chd

Client

File **TankShield2_modG.std**

Date/Time **15-Nov-2004 16:25**



Wind Loading in -Z Direction



Software licensed to INEEL

Job No

EDF-5017 R1

Sheet No

40 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

Ref

By R Lippert

Date Oct 2004

Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Job Information

Engineer

Checked

Approved

Name: R Lippert

Date: Oct 2004

Structure Type SPACE FRAME

Number of Nodes	62	Highest Node	77
Number of Elements	96	Highest Beam	116

Number of Basic Load Cases	4
Number of Combination Load Cases	5

Included in this printout are data for:

All The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
------	-----	------

Combination	5	DL
Combination	6	DL+0.7E
Combination	7	DL+W
Combination	8	0.6DL+0.7E
Combination	9	0.6DL+W

Nodes

Node	X (in)	Y (in)	Z (in)
1	0.000	0.000	0.000
2	0.000	0.000	3.500
3	116.500	0.000	0.000
4	116.500	0.000	3.500
5	120.000	0.000	0.000
6	120.000	0.000	3.500
7	116.500	0.000	120.500
8	120.000	0.000	120.500
9	0.000	13.500	0.000
10	0.000	13.500	3.500
11	116.500	13.500	0.000
12	116.500	13.500	3.500
13	120.000	13.500	0.000
14	120.000	13.500	3.500
15	116.500	13.500	120.500
16	120.000	13.500	120.500
17	0.000	73.500	0.000
18	0.000	73.500	3.500
19	116.500	73.500	0.000



Software licensed to INEEL

Job No

EDF-5017 R1

Sheet No

41 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

Ref

By R Lippert Date Oct 2004 Chd
File TankShield2_modG.std Date/Time 15-Nov-2004 16:25

Client

Nodes Cont...

Node	X (in)	Y (in)	Z (in)
20	116.500	73.500	3.500
21	120.000	73.500	0.000
22	120.000	73.500	3.500
23	116.500	73.500	120.500
24	120.000	73.500	120.500
25	0.000	13.500	1.750
26	120.000	13.500	1.750
27	118.250	13.500	3.500
28	118.250	13.500	120.500
29	0.000	36.000	3.500
30	0.000	36.000	0.000
31	116.500	36.000	0.000
32	116.500	36.000	3.500
33	120.000	36.000	0.000
34	120.000	36.000	3.500
35	116.500	36.000	120.500
36	120.000	36.000	120.500
51	102.000	73.500	3.500
52	116.500	73.500	18.000
53	103.750	13.500	1.750
54	118.250	13.500	16.250
55	0.000	0.000	-24.000
57	0.000	24.000	0.000
58	0.000	27.692	-5.538
59	0.000	103.500	0.000
60	0.000	103.500	3.500
61	116.500	103.500	0.000
62	116.500	103.500	3.500
63	120.000	103.500	0.000
64	120.000	103.500	3.500
65	116.500	103.500	120.500
66	120.000	103.500	120.500
67	102.000	103.500	3.500
68	116.500	103.500	18.000
69	0.000	0.000	27.500
70	0.000	24.000	3.500
71	0.000	27.692	9.038
72	92.500	0.000	120.500
73	144.000	0.000	120.500
74	116.500	24.000	120.500
75	120.000	24.000	120.500
76	110.962	27.692	120.500
77	125.538	27.692	120.500



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
42 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Beams

Beam	Node A	Node B	Length (in)	Property	β (degrees)
1	1	9	13.500	1	0
2	2	10	13.500	1	0
3	3	11	13.500	1	0
4	4	12	13.500	1	0
5	5	13	13.500	1	0
6	6	14	13.500	1	0
7	7	15	13.500	1	0
8	8	16	13.500	1	0
9	9	57	10.500	1	0
10	10	70	10.500	1	0
11	11	31	22.500	1	0
12	12	32	22.500	1	0
13	13	33	22.500	1	0
14	14	34	22.500	1	0
15	15	74	10.500	1	0
16	16	75	10.500	1	0
17	9	25	1.750	2	0
18	13	26	1.750	2	0
19	14	27	1.750	2	0
20	16	28	1.750	2	0
21	25	10	1.750	2	0
22	26	14	1.750	2	0
23	27	12	1.750	2	0
24	28	15	1.750	2	0
25	25	53	103.750	2	0
26	27	54	12.750	2	0
27	29	18	37.500	1	0
28	30	17	37.500	1	0
29	31	19	37.500	1	0
30	32	20	37.500	1	0
31	33	21	37.500	1	0
32	34	22	37.500	1	0
33	35	23	37.500	1	0
34	36	24	37.500	1	0
35	30	29	3.500	4	0
36	17	18	3.500	4	0
37	21	19	3.500	4	0
38	33	31	3.500	4	0
39	21	22	3.500	4	0
40	33	34	3.500	4	0
41	36	35	3.500	4	0
42	24	23	3.500	4	0
43	17	19	116.500	2	0
44	18	51	102.000	2	0
45	20	22	3.500	4	0
46	32	34	3.500	4	0



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
43 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Beams Cont...

Beam	Node A	Node B	Length (in)	Property	β (degrees)
47	22	24	117.000	2	0
48	20	52	14.500	2	0
63	51	20	14.500	2	0
64	52	23	102.500	2	0
65	51	52	20.506	1	0
66	53	26	16.250	2	0
67	54	28	104.250	2	0
68	53	54	20.506	1	0
71	16	22	131.488	1	0
72	9	19	131.043	1	0
75	57	30	12.000	1	0
76	55	58	33.282	1	0
77	58	30	9.985	1	0
78	57	58	6.656	1	0
79	17	59	30.000	3	0
80	18	60	30.000	3	0
81	19	61	30.000	3	0
82	20	62	30.000	3	0
83	21	63	30.000	3	0
84	22	64	30.000	3	0
85	23	65	30.000	3	0
86	24	66	30.000	3	0
89	59	60	3.500	4	0
90	63	61	3.500	4	0
91	63	64	3.500	4	0
92	66	65	3.500	4	0
93	59	61	116.500	2	0
94	60	67	102.000	2	0
95	62	64	3.500	4	0
96	64	66	117.000	2	0
97	62	68	14.500	2	0
98	67	62	14.500	2	0
99	68	65	102.500	2	0
100	67	68	20.506	1	0
101	70	29	12.000	1	0
102	57	70	3.500	4	0
103	69	71	33.282	1	0
104	71	29	9.985	1	0
105	70	71	6.656	1	0
106	10	20	131.043	1	0
107	15	20	131.488	1	0
108	72	76	33.282	1	0
109	73	77	33.282	1	0
110	74	35	12.000	1	0
111	75	36	12.000	1	0
112	76	35	9.984	1	0



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
44 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Beams Cont...

Beam	Node A	Node B	Length (in)	Property (degrees)	β
113	74	76	6.656	1	0
114	77	36	9.984	1	0
115	75	77	6.656	1	0
116	74	75	3.500	4	0

Section Properties

Prop	Section	Area (in ²)	I _{yy} (in ⁴)	I _{zz} (in ⁴)	J (in ⁴)	Material
1	TUB20203	1.270	0.700	0.700	1.116	STEEL
2	TUBE	1.551	0.533	1.683	1.241	STEEL
3	TUBE	0.984	0.288	0.288	0.424	STEEL
4	BAR3X3/8	1.125	0.013	0.844	0.053	STEEL

Materials

Mat	Name	E (kip/in ²)	v	Density (kip/in ³)	α (1/F)
1	STEEL	29E 3	0.300	0.000	6.5E -6
2	ALUMINUM	10E 3	0.330	0.000	12.8E -6
3	CONCRETE	3.15E 3	0.170	0.000	5.5E -6

Supports

Node	X (kip/in)	Y (kip/in)	Z (kip/in)	rX (kip·ft/deg)	rY (kip·ft/deg)	rZ (kip·ft/deg)
1	Fixed	Fixed	Fixed	-	-	-
2	Fixed	Fixed	Fixed	-	-	-
3	Fixed	Fixed	Fixed	-	-	-
4	Fixed	Fixed	Fixed	-	-	-
5	Fixed	Fixed	Fixed	-	-	-
6	Fixed	Fixed	Fixed	-	-	-
7	Fixed	Fixed	Fixed	-	-	-
8	Fixed	Fixed	Fixed	-	-	-
55	Fixed	Fixed	Fixed	-	-	-
69	Fixed	Fixed	Fixed	-	-	-
72	Fixed	Fixed	Fixed	-	-	-
73	Fixed	Fixed	Fixed	-	-	-



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
45 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Basic Load Cases

Number	Name
1	FRAME DL
2	PLATE DL
3	SEISMIC -Z (0.108 G)
4	WIND -Z

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
5	DL	1	FRAME DL	1.00
		2	PLATE DL	1.00
6	DL+0.7E	1	FRAME DL	1.00
		2	PLATE DL	1.00
7	DL+W	3	SEISMIC -Z (0.108 G)	0.70
		1	FRAME DL	1.00
8	0.6DL+0.7E	2	PLATE DL	1.00
		4	WIND -Z	1.00
9	0.6DL+W	1	FRAME DL	0.60
		2	PLATE DL	0.60
		3	SEISMIC -Z (0.108 G)	0.70
		4	WIND -Z	1.00

Selfweight : 1 FRAME DL

Direction	Factor
Y	-1.000

Node Loads : 2 PLATE DL

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip·in)	MY (kip·in)	MZ (kip·in)
25	-	-3.280	-	-	-	-
26	-	-3.280	-	-	-	-
27	-	-3.168	-	-	-	-
28	-	-3.168	-	-	-	-



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
46 of 148

Rev

Part

Ref

By R Lippert Date Oct 2004 Chd

Client File TankShield2_modG.std Date/Time 15-Nov-2004 16:25

Node Loads : 3 SEISMIC -Z (0.108 G)

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip·in)	MY (kip·in)	MZ (kip·in)
9	-	-	-0.044	-	-	-
11	-	-	-0.044	-	-	-
12	-	-	-0.042	-	-	-
14	-	-	-0.042	-	-	-
59	-	-	-0.313	-	-	-
61	-	-	-0.313	-	-	-
62	-	-	-0.301	-	-	-
64	-	-	-0.301	-	-	-

Selfweight : 3 SEISMIC -Z (0.108 G)

Direction Factor

Z -0.108

Node Loads : 4 WIND -Z

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip·in)	MY (kip·in)	MZ (kip·in)
9	-	-	-0.068	-	-	-
11	-	-	-0.068	-	-	-
59	-	-	-0.486	-	-	-
61	-	-	-0.486	-	-	-

Node Displacement Summary

	Node	L/C	X (in)	Y (in)	Z (in)	Resultant (in)	rX (deg)	rY (deg)	rZ (deg)
Max X	59	7:DL+W	0.006	-0.009	-0.370	0.371	-0.304	-0.104	-0.009
Min X	68	9:0.6DL+W	-0.018	0.005	-0.050	0.053	-0.012	-0.057	0.009
Max Y	60	9:0.6DL+W	-0.003	0.009	-0.371	0.371	-0.303	-0.174	-0.010
Min Y	59	7:DL+W	0.006	-0.009	-0.370	0.371	-0.304	-0.104	-0.009
Max Z	10	9:0.6DL+W	0.001	0.000	0.010	0.010	-0.001	-0.007	-0.005
Min Z	59	9:0.6DL+W	0.005	-0.009	-0.371	0.371	-0.304	-0.104	-0.005
Max rX	2	7:DL+W	0.000	0.000	0.000	0.000	0.065	-0.008	-0.003
Min rX	59	9:0.6DL+W	0.005	-0.009	-0.371	0.371	-0.304	-0.104	-0.005
Max rY	72	6:DL+0.7E	0.000	0.000	0.000	0.000	-0.021	0.026	-0.001
Min rY	63	9:0.6DL+W	0.005	-0.001	-0.050	0.050	-0.033	-0.232	-0.005
Max rZ	68	6:DL+0.7E	-0.007	0.003	-0.065	0.065	-0.005	-0.023	0.016
Min rZ	55	7:DL+W	0.000	0.000	0.000	0.000	0.037	-0.002	-0.014
Max Rst	59	9:0.6DL+W	0.005	-0.009	-0.371	0.371	-0.304	-0.104	-0.005



Software licensed to INEEL

Job No
EDF-5017 R1

Sheet No

47 of 148

Rev

Part

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment	
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·in)	MY (kip·in)
1	5:DL	0.017	1.494	0.013	0.000	0.000
	6:DL+0.7E	0.021	1.946	-0.105	0.000	0.000
	7:DL+W	0.012	2.421	-0.235	0.000	0.000
	8:0.6DL+0.7E	0.014	1.348	-0.111	0.000	0.000
	9:0.6DL+W	0.005	1.823	-0.241	0.000	0.000
2	5:DL	0.018	1.507	-0.011	0.000	0.000
	6:DL+0.7E	0.017	1.054	-0.128	0.000	0.000
	7:DL+W	0.021	0.574	-0.258	0.000	0.000
	8:0.6DL+0.7E	0.010	0.451	-0.124	0.000	0.000
	9:0.6DL+W	0.014	-0.029	-0.254	0.000	0.000
3	5:DL	0.000	0.409	-0.000	0.000	0.000
	6:DL+0.7E	0.000	0.791	0.030	0.000	0.000
	7:DL+W	-0.000	0.704	0.049	0.000	0.000
	8:0.6DL+0.7E	0.000	0.628	0.030	0.000	0.000
	9:0.6DL+W	-0.001	0.540	0.049	0.000	0.000
4	5:DL	0.008	1.952	0.013	0.000	0.000
	6:DL+0.7E	0.008	1.787	0.150	0.000	0.000
	7:DL+W	0.007	1.834	0.106	0.000	0.000
	8:0.6DL+0.7E	0.005	1.006	0.145	0.000	0.000
	9:0.6DL+W	0.004	1.053	0.101	0.000	0.000
5	5:DL	-0.020	1.873	0.034	0.000	0.000
	6:DL+0.7E	-0.030	2.855	0.196	0.000	0.000
	7:DL+W	-0.030	2.541	0.140	0.000	0.000
	8:0.6DL+0.7E	-0.022	2.106	0.183	0.000	0.000
	9:0.6DL+W	-0.022	1.792	0.126	0.000	0.000
6	5:DL	-0.020	2.736	0.011	0.000	0.000
	6:DL+0.7E	-0.019	2.118	0.172	0.000	0.000
	7:DL+W	-0.020	2.342	0.115	0.000	0.000
	8:0.6DL+0.7E	-0.011	1.024	0.167	0.000	0.000
	9:0.6DL+W	-0.012	1.247	0.111	0.000	0.000
7	5:DL	0.011	1.469	-0.030	0.000	0.000
	6:DL+0.7E	0.008	1.247	0.104	0.000	0.000
	7:DL+W	0.005	1.312	0.063	0.000	0.000
	8:0.6DL+0.7E	0.004	0.659	0.116	0.000	0.000
	9:0.6DL+W	0.001	0.725	0.075	0.000	0.000
8	5:DL	-0.012	1.459	-0.030	0.000	0.000
	6:DL+0.7E	-0.015	1.206	0.109	0.000	0.000
	7:DL+W	-0.018	1.255	0.068	0.000	0.000
	8:0.6DL+0.7E	-0.010	0.623	0.121	0.000	0.000
	9:0.6DL+W	-0.013	0.671	0.080	0.000	0.000
55	5:DL	-0.002	0.275	0.181	0.000	0.000
	6:DL+0.7E	-0.002	0.692	0.435	0.000	0.000
	7:DL+W	-0.008	1.134	0.702	0.000	0.000
	8:0.6DL+0.7E	-0.001	0.582	0.362	0.000	0.000
	9:0.6DL+W	-0.007	1.024	0.629	0.000	0.000



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
48 of 148

Rev

Part

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Reactions Cont...

Node	L/C	Horizontal		Vertical		Horizontal			Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·in)	MY (kip·in)	MZ (kip·in)				
69	5:DL	-0.002	0.278	-0.182	0.000	0.000	0.000				
	6:DL+0.7E	-0.001	-0.140	0.072	0.000	0.000	0.000				
	7:DL+W	0.005	-0.583	0.340	0.000	0.000	0.000				
	8:0.6DL+0.7E	-0.000	-0.251	0.145	0.000	0.000	0.000				
	9:0.6DL+W	0.006	-0.694	0.413	0.000	0.000	0.000				
72	5:DL	0.178	0.272	0.001	0.000	0.000	0.000				
	6:DL+0.7E	0.150	0.230	0.013	0.000	0.000	0.000				
	7:DL+W	0.164	0.252	0.008	0.000	0.000	0.000				
	8:0.6DL+0.7E	0.078	0.121	0.012	0.000	0.000	0.000				
	9:0.6DL+W	0.092	0.143	0.008	0.000	0.000	0.000				
73	5:DL	-0.177	0.270	0.001	0.000	0.000	0.000				
	6:DL+0.7E	-0.137	0.209	0.016	0.000	0.000	0.000				
	7:DL+W	-0.138	0.210	0.011	0.000	0.000	0.000				
	8:0.6DL+0.7E	-0.066	0.101	0.016	0.000	0.000	0.000				
	9:0.6DL+W	-0.067	0.102	0.011	0.000	0.000	0.000				

Failure Ratio

Beam	Analysis	Property	New Property	Ratio	Ay (in ²)	Az (in ²)	Ax (in ²)	Dw (in)	Bf (in)	Iz (in ⁴)	Iy (in ⁴)	Ix (in ⁴)
1	TUB20203	TUB20203		0.229	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
2	TUB20203	TUB20203		0.194	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
3	TUB20203	TUB20203		0.052	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
4	TUB20203	TUB20203		0.154	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
5	TUB20203	TUB20203		0.229	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
6	TUB20203	TUB20203		0.184	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
7	TUB20203	TUB20203		0.108	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
8	TUB20203	TUB20203		0.115	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
9	TUB20203	TUB20203		0.253	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
10	TUB20203	TUB20203		0.233	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
11	TUB20203	TUB20203		0.053	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
12	TUB20203	TUB20203		0.047	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
13	TUB20203	TUB20203		0.022	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
14	TUB20203	TUB20203		0.036	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
15	TUB20203	TUB20203		0.069	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
16	TUB20203	TUB20203		0.074	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
17	TUBE	TUB E		0.107	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
18	TUBE	TUB E		0.173	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
19	TUBE	TUB E		0.099	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
20	TUBE	TUB E		0.101	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
21	TUBE	TUB E		0.225	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
22	TUBE	TUB E		0.088	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
23	TUBE	TUB E		0.105	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
24	TUBE	TUB E		0.098	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
49 of 148

Rev

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Part

Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Failure Ratio Cont...

Beam	Analysis	Property	New Property	Ratio	Ay (in ²)	Az (in ²)	Ax (in ²)	Dw (in)	Bf (in)	Iz (in ⁴)	Iy (in ⁴)	Ix (in ⁴)
25	TUBE	TUB E		0.028	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
26	TUBE	TUB E		0.065	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
27	TUB20203	TUB20203		0.432	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
28	TUB20203	TUB20203		0.520	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
29	TUB20203	TUB20203		0.080	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
30	TUB20203	TUB20203		0.035	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
31	TUB20203	TUB20203		0.056	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
32	TUB20203	TUB20203		0.040	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
33	TUB20203	TUB20203		0.057	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
34	TUB20203	TUB20203		0.054	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
35	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
36	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
37	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
38	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
39	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
40	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
41	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
42	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
43	TUBE	TUB E		0.047	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
44	TUBE	TUB E		0.040	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
45	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
46	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
47	TUBE	TUB E		0.068	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
48	TUBE	TUB E		0.046	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
63	TUBE	TUB E		0.022	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
64	TUBE	TUB E		0.053	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
65	TUB20203	TUB20203		0.038	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
66	TUBE	TUB E		0.024	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
67	TUBE	TUB E		0.107	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
68	TUB20203	TUB20203		0.020	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
71	TUB20203	TUB20203		0.059	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
72	TUB20203	TUB20203		0.063	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
75	TUB20203	TUB20203		0.269	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
76	TUB20203	TUB20203		0.126	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
77	TUB20203	TUB20203		0.249	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
78	TUB20203	TUB20203		0.118	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
79	TUBE	TUB E		0.435	0.563	0.563	0.984	1.500	1.500	0.288	0.288	0.424
80	TUBE	TUB E		0.450	0.563	0.563	0.984	1.500	1.500	0.288	0.288	0.424
81	TUBE	TUB E		0.107	0.563	0.563	0.984	1.500	1.500	0.288	0.288	0.424
82	TUBE	TUB E		0.233	0.563	0.563	0.984	1.500	1.500	0.288	0.288	0.424
83	TUBE	TUB E		0.204	0.563	0.563	0.984	1.500	1.500	0.288	0.288	0.424
84	TUBE	TUB E		0.237	0.563	0.563	0.984	1.500	1.500	0.288	0.288	0.424
85	TUBE	TUB E		0.173	0.563	0.563	0.984	1.500	1.500	0.288	0.288	0.424
86	TUBE	TUB E		0.170	0.563	0.563	0.984	1.500	1.500	0.288	0.288	0.424
89	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
90	BAR3X3/8	OX 3		0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
50 of 148

Rev

Part

Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Failure Ratio Cont...

Beam	Analysis	Property	New Property	Ratio	Ay (in ²)	Az (in ²)	Ax (in ²)	Dw (in)	Bf (in)	Iz (in ⁴)	Iy (in ⁴)	Ix (in ⁴)
91	BAR3X3/8	OX	3	0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
92	BAR3X3/8	OX	3	0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
93	TUBE	TUB	E	0.056	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
94	TUBE	TUB	E	0.059	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
95	BAR3X3/8	OX	3	0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
96	TUBE	TUB	E	0.072	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
97	TUBE	TUB	E	0.073	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
98	TUBE	TUB	E	0.037	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
99	TUBE	TUB	E	0.076	1.128	0.564	1.551	3.000	1.500	1.683	0.533	1.241
100	TUB20203	TUB20203		0.051	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
101	TUB20203	TUB20203		0.235	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
102	BAR3X3/8	OX	3	0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053
103	TUB20203	TUB20203		0.101	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
104	TUB20203	TUB20203		0.223	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
105	TUB20203	TUB20203		0.129	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
106	TUB20203	TUB20203		0.070	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
107	TUB20203	TUB20203		0.056	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
108	TUB20203	TUB20203		0.000	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
109	TUB20203	TUB20203		0.000	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
110	TUB20203	TUB20203		0.024	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
111	TUB20203	TUB20203		0.025	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
112	TUB20203	TUB20203		0.000	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
113	TUB20203	TUB20203		0.000	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
114	TUB20203	TUB20203		0.000	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
115	TUB20203	TUB20203		0.000	0.750	0.750	1.270	2.000	2.000	0.700	0.700	1.200
116	BAR3X3/8	OX	3	0.000	1.125	1.125	1.125	3.000	0.375	0.844	0.013	0.053



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
51 of 148

Rev

					Part	
Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING					Ref	
By R Lippert			Date Oct 2004		Chd	
Client			File TankShield2_modG.std		Date/Time 15-Nov-2004 16:25	

Beam Combined Axial and Bending Stresses Summary

Beam	L/C	Length (in)	Max Comp			Max Tens		
			Stress (psi)	d (in)	Corner	Stress (psi)	d (in)	Corner
35	5:DL	3.500	274.390	0.000	1			
	6:DL+0.7E	3.500	673.730	3.500	3	-381.395	3.500	1
	7:DL+W	3.500	1.26E 3	0.000	1	-971.159	0.000	3
	8:0.6DL+0.7E	3.500	582.709	0.000	1	-407.098	0.000	3
	9:0.6DL+W	3.500	1.2E 3	0.000	1	-1.02E 3	0.000	3
36	5:DL	3.500	104.031	3.500	3	-103.973	3.500	1
	6:DL+0.7E	3.500	6.01E 3	3.500	2	-6.02E 3	3.500	4
	7:DL+W	3.500	13.8E 3	3.500	2	-13.8E 3	3.500	4
	8:0.6DL+0.7E	3.500	6E 3	3.500	2	-6E 3	3.500	4
	9:0.6DL+W	3.500	13.8E 3	3.500	2	-13.8E 3	3.500	4
37	5:DL	3.500	1.09E 3	3.500	3	-1.12E 3	3.500	1
	6:DL+0.7E	3.500	3.73E 3	3.500	4	-3.84E 3	3.500	2
	7:DL+W	3.500	3.2E 3	3.500	4	-3.32E 3	3.500	2
	8:0.6DL+0.7E	3.500	3.34E 3	3.500	4	-3.43E 3	3.500	2
	9:0.6DL+W	3.500	2.81E 3	3.500	4	-2.92E 3	3.500	2
38	5:DL	3.500	384.453	0.000	1	-384.785	0.000	3
	6:DL+0.7E	3.500	1.37E 3	0.000	1	-1.37E 3	0.000	2
	7:DL+W	3.500	1.22E 3	3.500	3	-1.23E 3	3.500	1
	8:0.6DL+0.7E	3.500	1.28E 3	3.500	3	-1.28E 3	3.500	1
	9:0.6DL+W	3.500	1.15E 3	3.500	3	-1.15E 3	3.500	1
39	5:DL	3.500	744.349	3.500	3	-737.358	3.500	1
	6:DL+0.7E	3.500	4.48E 3	0.000	3	-4.89E 3	0.000	1
	7:DL+W	3.500	5.19E 3	0.000	1	-5.5E 3	0.000	2
	8:0.6DL+0.7E	3.500	4.19E 3	0.000	4	-4.61E 3	0.000	1
	9:0.6DL+W	3.500	4.9E 3	0.000	1	-5.21E 3	0.000	2
40	5:DL	3.500	850.305	3.500	2	-822.096	3.500	4
	6:DL+0.7E	3.500	1.04E 3	0.000	1	-959.878	0.000	3
	7:DL+W	3.500	1.3E 3	0.000	1	-1.25E 3	0.000	2
	8:0.6DL+0.7E	3.500	1.33E 3	0.000	1	-1.26E 3	0.000	3
	9:0.6DL+W	3.500	1.59E 3	0.000	1	-1.54E 3	0.000	2
41	5:DL	3.500	223.281	0.000	1			
	6:DL+0.7E	3.500	753.785	0.000	1	-526.652	0.000	2
	7:DL+W	3.500	605.582	0.000	1	-365.612	0.000	2
	8:0.6DL+0.7E	3.500	664.473	0.000	1	-551.707	0.000	2
	9:0.6DL+W	3.500	516.270	0.000	1	-390.666	0.000	2
42	5:DL	3.500	119.462	3.500	4	-119.499	3.500	2
	6:DL+0.7E	3.500	574.266	0.000	1	-574.912	0.000	2
	7:DL+W	3.500	856.896	3.500	4	-858.502	3.500	2
	8:0.6DL+0.7E	3.500	608.861	0.000	1	-609.493	0.000	2
	9:0.6DL+W	3.500	809.112	3.500	4	-810.703	3.500	2
45	5:DL	3.500	1.04E 3	0.000	3	-1.04E 3	0.000	1
	6:DL+0.7E	3.500	2.36E 3	0.000	1	-2.29E 3	0.000	2
	7:DL+W	3.500	2.97E 3	0.000	1	-2.88E 3	0.000	2
	8:0.6DL+0.7E	3.500	2.24E 3	3.500	3	-2.17E 3	3.500	1
	9:0.6DL+W	3.500	2.73E 3	0.000	1	-2.65E 3	0.000	2



Software licensed to INEEL

Job No
EDF-5017 R1Sheet No
52 of 148

Rev

Part

Job Title V-TANK CONTENTS REMOVAL -- CONSOLIDATION TANK SHIELDING

Ref

By R Lippert Date Oct 2004 Chd

Client

File TankShield2_modG.std

Date/Time 15-Nov-2004 16:25

Beam Combined Axial and Bending Stresses Summary Cont...

Beam	L/C	Length (in)	Max Comp			Max Tens		
			Stress (psi)	d (in)	Corner	Stress (psi)	d (in)	Corner
46	5:DL	3.500	577.425	3.500	4	-553.500	3.500	2
	6:DL+0.7E	3.500	1.07E 3	3.500	4	-1.04E 3	3.500	2
	7:DL+W	3.500	695.014	3.500	4	-666.456	3.500	2
	8:0.6DL+0.7E	3.500	837.283	3.500	4	-820.950	3.500	2
	9:0.6DL+W	3.500	464.044	3.500	4	-445.056	3.500	2
89	5:DL	3.500	75.706	3.500	4	-75.774	3.500	2
	6:DL+0.7E	3.500	3.48E 3	0.000	3	-3.68E 3	0.000	1
	7:DL+W	3.500	7.7E 3	3.500	2	-8.15E 3	3.500	4
	8:0.6DL+0.7E	3.500	3.48E 3	0.000	3	-3.68E 3	0.000	1
	9:0.6DL+W	3.500	7.73E 3	3.500	2	-8.18E 3	3.500	4
90	5:DL	3.500	501.607	3.500	3	-490.969	3.500	1
	6:DL+0.7E	3.500	5.74E 3	3.500	4	-5.75E 3	3.500	2
	7:DL+W	3.500	13E 3	3.500	4	-12.9E 3	3.500	2
	8:0.6DL+0.7E	3.500	5.54E 3	3.500	4	-5.55E 3	3.500	2
	9:0.6DL+W	3.500	12.8E 3	3.500	4	-12.7E 3	3.500	2
91	5:DL	3.500	467.658	3.500	3	-453.423	3.500	1
	6:DL+0.7E	3.500	5.92E 3	0.000	3	-6.02E 3	0.000	1
	7:DL+W	3.500	7.8E 3	0.000	1	-8.44E 3	0.000	2
	8:0.6DL+0.7E	3.500	5.82E 3	0.000	3	-5.93E 3	0.000	1
	9:0.6DL+W	3.500	7.71E 3	0.000	1	-8.36E 3	0.000	2
92	5:DL	3.500	35.806	3.500	3	-35.812	3.500	1
	6:DL+0.7E	3.500	1.19E 3	3.500	4	-1.19E 3	3.500	2
	7:DL+W	3.500	1.96E 3	3.500	4	-1.96E 3	3.500	2
	8:0.6DL+0.7E	3.500	1.18E 3	3.500	4	-1.18E 3	3.500	2
	9:0.6DL+W	3.500	1.95E 3	3.500	4	-1.95E 3	3.500	2
95	5:DL	3.500	561.208	0.000	3	-548.193	0.000	1
	6:DL+0.7E	3.500	2.05E 3	0.000	1	-2.02E 3	0.000	2
	7:DL+W	3.500	6.63E 3	0.000	1	-6.68E 3	0.000	2
	8:0.6DL+0.7E	3.500	2.27E 3	0.000	1	-2.24E 3	0.000	2
	9:0.6DL+W	3.500	6.85E 3	0.000	1	-6.9E 3	0.000	2
102	5:DL	3.500	182.347	0.000	1	-91.510	0.000	4
	6:DL+0.7E	3.500	1.45E 3	3.500	3	-1.36E 3	3.500	1
	7:DL+W	3.500	2.85E 3	3.500	3	-2.76E 3	3.500	1
	8:0.6DL+0.7E	3.500	1.44E 3	3.500	3	-1.38E 3	3.500	1
	9:0.6DL+W	3.500	2.83E 3	3.500	3	-2.78E 3	3.500	1
116	5:DL	3.500	149.065	0.000	1	-60.642	0.000	4
	6:DL+0.7E	3.500	637.207	0.000	2	-552.511	0.000	1
	7:DL+W	3.500	542.746	0.000	2	-457.492	0.000	1
	8:0.6DL+0.7E	3.500	619.423	3.500	3	-570.096	3.500	1
	9:0.6DL+W	3.500	493.459	3.500	3	-443.574	3.500	1